

The Design and Implementation of a Health and Lifestyle Screening App to Improve the Care of Young People in General Practice

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Abstract

Adolescence and young adulthood are periods of major transition in physical, cognitive, social, and emotional development along the journey from childhood to adulthood. However, despite experiencing a high prevalence and co-occurrence of mental health disorders and lifestyle issues, young people do not usually seek professional help for these concerns. Yet, young people do regularly attend general practice, usually to address physiological concerns, making General Practitioners (GPs) ideally situated to opportunistically discuss a range of health and lifestyle issues and to provide health promotion and early intervention as needed. Technology-based screening provides an acceptable and systematic format for identifying health issues before the consultation. However, this screening technology is not being utilised by GPs.

The aim of my research was to investigate the design, implementation, and effectiveness of a preventive screening technology intervention for supporting conversations about young people's health and lifestyle risks in general practice. To address this aim I conducted three studies using a mixed methods multiphase design. The first study was a systematic review of the literature, which provided an understanding of the need and rationale for developing a health and lifestyle technology-based screening tool in primary care. The second study was a series of co-design workshops with 16 young people, 8 GPs, and 8 parents of young people, and interviews conducted with 11 practice support staff, to identify and explore user and stakeholder design and implementation requirements of a technology-based screening tool.

The final study was an effectiveness-implementation study in one general practice clinic in Melbourne, Australia. For the effectiveness component of the final study, I compared the exit surveys of 30 young people in a one-month pre-intervention, treatment-as-usual phase with 85 young people using a health and lifestyle screening app in a two-month intervention phase, when the app was integrated into young people's routine care. I also conducted semi-structured interviews with

14 young people from the intervention group. The implementation component of the final study was an in-depth implementation case study, with methodology informed by action research. Semi-structured interviews and focus groups were conducted with four GPs and seven support staff at the end of the implementation period. In addition, I analysed the number of times staff were supported by researchers, the location where young people completed the app, whether they felt they had sufficient privacy and received a text messaging (short message service, SMS) link at the time of making their appointment.

I present the findings of my studies in this thesis in four published peer reviewed articles. The results indicated that integrating a health and lifestyle screening app into face-to-face regular care of young people improved patient-centred care, and created scope to identify and address unmet health needs. However, the implementation of the app in the dynamic and time-poor general practice setting presented a range of technical and administrative challenges.

My research shows that an effective way to engage young people in their health and wellbeing may be to resource preventive screening implementation into routine general practice care. My research also provides evidence that to drive and support sustainable technology innovation and implementation in general practice settings more resources, external to existing practice staff, are needed.

Declaration

This thesis comprises my original work towards the degree of Doctor of Philosophy except where indicated in the preface.

I certify that:

1. It is within 100,000 words (excluding tables, maps, bibliography, and appendices)
2. Due acknowledgement has been made to all materials used.

A handwritten signature in dark ink, appearing to read 'Marianne Webb', with a stylized, cursive script.

Marianne Webb

Preface

This research was supported by a scholarship from the Young and Well Cooperative Research Centre, which provided money for my stipend and for associated project costs, including technology development, publication fees, and conference registrations.

In this thesis I present the results of three studies in article format in four chapters. I was responsible for writing ethics applications, conducting the recruitment and data collection for all studies, with the exception of the youth participants in Study 3 where I was assisted by Oshara de Silva and Shaunagh O’Sullivan. I also led the data analysis and drafted the papers. All article co-authors contributed to the study design, analysis and interpretation of the data, and critically reviewed and edited the articles prior to publication.

The following peer reviewed papers have been all been published in academic journals:

Chapter 4

Webb, M., Ozer, E. M., Haller, D. M., Kauer, S., & Sanci, L. A. (2016). Does screening for and intervening with multiple health compromising behaviours and mental health disorders amongst young people attending primary care improve health outcomes? A systematic review. *BMC Family Practice*, 17, 104.

Chapter 6

Webb, M. J., Wadley, G., & Sanci, L. A. (2017). Improving Patient-Centered Care for Young People in General Practice With a Codesigned Screening App: Mixed Methods Study. *JMIR mHealth uHealth*, 5(8), e118.

Chapter 7

Webb, M. J., Wadley, G., & Sanci, L. A. (2018). Experiences of General Practitioners and Practice Support Staff using a health and lifestyle screening app in primary

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Chapter 5

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Conference presentations

Parts of this thesis have been presented at the following national and international conferences:

International

- Webb, M., Wadley, G., & Sanci, L. (March, 2017). Implementing a co-designed health and lifestyle screening app to improve patient-centred care for young people in primary care. Oral presentation at the *Society for Adolescent Health and Medicine Annual Meeting*: New Orleans, United States of America.
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National

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- Webb, M., Wadley, G., Kauer, S., & Sanci, L. (December, 2015). Designing a health screening tool to help young people communicate with their general

practitioner. Paper and oral presentation at the Australian Computer-Human Interaction Conference: Melbourne, Australia.

- Webb, M., Wadley, G., Kauer, S., & Sancı, L. (December, 2014). Technology-based psychosocial screening of young people in general practice. Paper and oral presentation at doctoral consortium at the Australian Computer-Human Interaction Conference: Adelaide, Australia. (Best Long Paper by a Student Award)
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Dr Ann-Maree Duncan proofread this thesis for spelling and grammar errors in accordance with the Guidelines for the Editing of Research Theses by Professional Editors.

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I was fortunate that Dr Greg Wadley was prepared to come on board to a research project after it had started and was in many ways the missing link in my supervision team. Thanks for the practical support, health technology design expertise, enthusiasm, perspective, regular encouragement and belief in me. I was regularly welcomed into his department and know that my PhD experience was greater for this opportunity. Thanks also to Dr Sylvia Kauer who was instrumental in helping me re-adjust to life as a student and supporting me through the many challenges of my first year. In addition, thanks to Professor Elizabeth Ozer and Dr Dagmar Haller for their generous, insightful and invaluable contribution to my systematic review.

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Finally, thanks to my family and friends for their ongoing support, patience, and understanding.

Abbreviations

BEACH	Bettering the Evaluation And Care of Health
eHealth	Healthcare supported by electronic process and communication
FTE	Full-time equivalent
GP	General Practitioner
HEEADSSS	Home environment, Education and employment, Eating, peer-related Activities, Drugs, Sex and Sexuality, Suicide/depression, and Safety from injury and violence
LGA	Local Government Area
MBS	Medicare Benefits Schedule
mHealth	Mobile technologies used for health
MRC	Medical Research Council
NPT	Normalisation Process Theory
PCP	Primary care provider
PDSA	Plan-Do-Study-Act
PHN	Primary Health Network
PRISMA	Preferred Reporting Items for Systematic Reviews and Meta-Analysis
RACGP	Royal Australian College of General Practitioners
RC	Reception coordinator
RCT	Randomised controlled trial
SMS	Short message service
TAU	Treatment-as-usual
VicReN	Victorian Primary Care Practice-Based Research Network

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PART ONE

1. Introduction

More than a quarter of the world's population is aged 10 to 24 years, and young people comprise a higher proportion of the population than at any time in history (Sawyer et al., 2012). However, while there have been significant improvements to the health of infants and children over the past 50 years, with decreased infectious disease, malnutrition, and mortality, the health of young people has improved far less (Sawyer et al., 2012). An estimated 1.3 million adolescents died in 2012 of preventable or treatable causes, including suicide and road injuries (World Health Organization, 2014). A range of health compromising behaviours start or are reinforced during the second decade of life, including substance use, diet and exercise habits, and obesity (World Health Organization, 2014). Indeed, 70% of preventable adult deaths from these non-communicable diseases are linked to risk factors that start in the second decade of life (World Health Organization, 2001). In addition, during adolescence and young adulthood serious mental health issues emerge, most of which go unrecognised and untreated (World Health Organization, 2014). Without appropriate intervention, these issues often persist into adulthood having a major impact on the lifetime health and wellbeing of individuals as well as having a broader burden on health and economic systems (Access Economics, 2009).

The World Health Organization has called for investment in the health of adolescents, not only as a fundamental human right, but also because it will lead to public health, economic, and social benefits across the life-course (World Health Organization, 2001). Investing in adolescent health brings a triple dividend of benefits; for adolescents now; for adolescents' future lives; and, for the next generation (Patton et al., 2016). For adolescents now, promotion of positive behaviours and early detection and treatment of problems, such as substance use disorders and sexually transmitted infections, can immediately benefit young people. For adolescents' future lives, health and lifestyle behaviours established in

adolescence, such as diet and physical activity, will set healthy habits that reduce morbidity and premature mortality later in life. For the next generation, investment in adolescent health has the potential to reduce mortality and fertility rates in low and middle income countries, contributing to accelerated economic growth. In high-income countries, investment in the health of low-income adolescents, who have higher birth rates and risk factors, can help to break intergenerational poverty and disadvantage.

General practice provides health care and promotion across the life-course. Thus, General Practitioners (GPs) are ideally situated to opportunistically discuss mental health and lifestyle issues with young people, and to provide health promotion and early intervention as needed. Although the majority of young people do not seek help for mental health and lifestyle risk behaviours (Johnson et al., 2016), most do see their GP at least once a year, typically for physiological concerns (Tylee, Haller, Graham, Churchill, & Sanci, 2007). Yet, although it is recommended as best practice, the rate of health and lifestyle screening of young people as part of their routine care in general practice remains low (Hassan et al., 2013; Klein & Wilson, 2002).

Technology-based screening provides an acceptable and systematic format for administering screening before the consultation (Gadomski et al., 2015). However, despite the need and potential advantages, screening technology is not being utilised by GPs (McInnes, Saltman, & Kidd, 2006; Schoen et al., 2012). There is little understanding of the requirements of users and stakeholders (including GPs, receptionists, young people and parents) for the design of these screening tools. Further, although there is increasing understanding of the barriers and facilitators to implementation in primary care (Lau et al., 2015), there are few that explore the dynamic contextual factors of implementing technology for young people. In addition, although we know that young people disclose more via technology than in face-to-face conversation (Bradford & Rickwood, 2015), there is a paucity of research exploring how using a technology-based screening tool affects young

people's experience of care in general practice and how they would like to use this screening technology.

1.1 Contribution of the thesis

This thesis makes a number of important contributions to knowledge about designing and implementing a health and lifestyle screening technology for young people in general practice settings. Firstly, it provides timely evidence via a systematic review of scientific literature that supports the routine use of screening and intervention of young people in general practice. Secondly, the thesis makes an original contribution by using iterative participatory methods with young people, GPs, practice support staff, and parents to both understand their design and implementation needs for a screening app in general practice, and to design a prototype app that meets these needs. Thirdly, I provide new knowledge about how using a screening app enriches young people's experience of patient-centred and youth-friendly care. Finally, this thesis provides an in-depth investigation of how GPs and practice staff integrate screening technology and data into their routine work, identifying problems that arise and how staff surmount them. In summary, this thesis will benefit future researchers and practitioners seeking to design and implement screening technology in real-world general practice settings.

1.2 Aim

The aim of this research was to investigate the design, implementation, and effectiveness of a preventive screening technology intervention for supporting conversations about health and lifestyle risks from young people and their doctors. This overarching aim was answered through the following four research questions:

1. Does prior research suggest that health and lifestyle screening improves health outcomes for young people presenting to general practice?

2. What are the preferences of young people, general practitioners, practice support staff and parents for the design, use, and implementation of a technology-based health and lifestyle screening tool for young people in general practice?
3. Does using a health and lifestyle app affect young people's assessment of care and disclosure when attending general practice as part of routine care?
4. Can a health and lifestyle screening app for young people be successfully implemented in a general practice setting?

1.3 Outline of thesis

This is a thesis with publication and it is divided into three parts. Part One consists of three chapters; this introduction, a literature review, and a discussion of the methodology used to address the research questions. Chapter 2 explores the background literature that provides the context and rationale for my research. I provide an overview of adolescent development, young people's health status and help-seeking behaviour, the general practice system in Australia, screening in general practice, and the potential and challenges of implementing screening technology to facilitate the identification of and early intervention with health issues in young people attending routine primary care. In Chapter 3, I provide an overview of the mixed method design of my research and describe the theoretical frameworks that have underpinned the research, the rationale for the methods used in each of my three studies, and the ethical considerations.

In Part Two I present four peer-reviewed published articles (Chapters 4 to 7), which describe the results of my three studies. Chapter 4 is a systematic review investigating whether screening for multiple health and lifestyle issues in the primary care setting effects health outcomes for young people. Chapter 5 describes the co-design design workshops conducted with young people, GPs, receptionists, and parents. The qualitative data from these workshops were used to identify the design and implementation requirements for a technology-based health and

lifestyle screening tool, that was subsequently developed into an app ('Check Up GP'). In Chapters 6 and 7, informed by the findings in the co-design workshops, I report on the mixed method implementation case study of a co-designed health and lifestyle screening app I conducted in one general practice. Chapter 6 explores the experience of young people using the app as part of their routine care, analysing quantitative and qualitative data. Chapter 7 explores the experience of general practitioners and the receptionists in implementing the screening app in their day-to-day work.

After the presentation of the journal papers, Part Three consists of Chapter 8 which presents a synthesis of the research findings, strengths, and limitations to the research, implications for policy and practice, and suggestions for future research avenues that would build on the findings from my research. At the end of Chapter 8, I make concluding comments on my research and its significance. Following Chapter 8 are References and Appendices.

2. Literature review

Adolescence and young adulthood are important periods for physical, cognitive, social and emotional development when a wide range of mental health problems and risky health-related behaviours emerge and co-occur, often persisting into adulthood. Identifying these issues and providing prevention and early intervention strategies may improve the health outcomes of young people. In this review, I explore the developmental changes that occur during adolescence and young adulthood, the mental health issues and health-compromising behaviours experienced by young people, how they seek help for these issues, and the way the health care system meets the needs of young people. The focus then moves to the potential of technology-based screening in identifying and addressing unmet health needs, before exploring the challenges and potential of this technology to be implemented into the routine care of young people attending general practice. The chapter ends by summarising gaps in current knowledge, and how my research intended to address these gaps.

2.1 Adolescent and young adult development

2.1.1 Definition of “young people” and developmental context

Major biological and psychological changes, and social role transitions occur in adolescence and young adulthood. While the age of onset of puberty is relatively uniform, the age at which adolescents transition into an adult phase of life varies with the socio-political and economic environment of the society and era they grow up in (Patton et al., 2016). Adding to the confusion, the terms adolescence, youth, young adult, teenager, and young people may have different meanings and age ranges but tend to be used interchangeably. In their overview of adolescence, Sawyer et al. (2012) have argued that 10 to 24 years is an appropriate representative age range of the physical and psychosocial changes that typically occur to reach maturity, with further division to describe different developmental tasks that occur in early adolescence (10 to 14 years), late adolescence (15 to 19 years) and young adulthood (20 to 24 years) (Sawyer et al., 2012). I have used

term *young people* in this chapter in the same way as Sawyer and colleagues to refer to adolescents and young adults aged 10 to 24 years.

The many development tasks undertaken during adolescence and young adulthood can be grouped into four primary areas (Christie & Viner, 2005): (1) the achievement of biological and sexual maturation; (2) The development of personal identity; (3) The development of intimate sexual relationships with an appropriate peer; and (4) The establishment of social independence and autonomy. These developmental tasks vary for individuals across each of the three stages of adolescence. In early adolescence, young people enter puberty and begin the process of sexual maturation. This is commonly accompanied by the development of a sense of identity, becoming increasingly influenced by peers, and testing rules and limits. In late adolescence, as physical changes continue, there is an increased capacity for abstract thought and setting goals, and an increased desire for independence. By young adulthood young women are typically fully developed physically, while young men are continuing to develop. In both sexes adulthood brings an ability to delay gratification, increased concern for the future and a firmer sense of identity and emotional stability. However, evidence suggests it is not until the early 20s that the area of the brain responsible for self-control, judgment, and decision-making matures (Sawyer et al., 2012).

Sawyer and colleagues have developed a conceptual framework to describe the complex interconnected individual and contextual factors that influence young people's health and development within the life course (their model is reproduced in Figure 2.1). These factors are puberty and social-role transitions, health-related states and behaviours, risk and protective factors, and social determinants of health. All of these factors interact dynamically to influence health outcomes and the transition into adulthood, while themselves being influenced by preconception factors, prenatal development and early child development (Sawyer et al., 2012). This thesis is focused on developing and implementing a tool for young people attending primary care which screens for risk and protective factors, health-

related behaviours and states, and health-related issues due to puberty and social-role transitions, which I expand upon below.

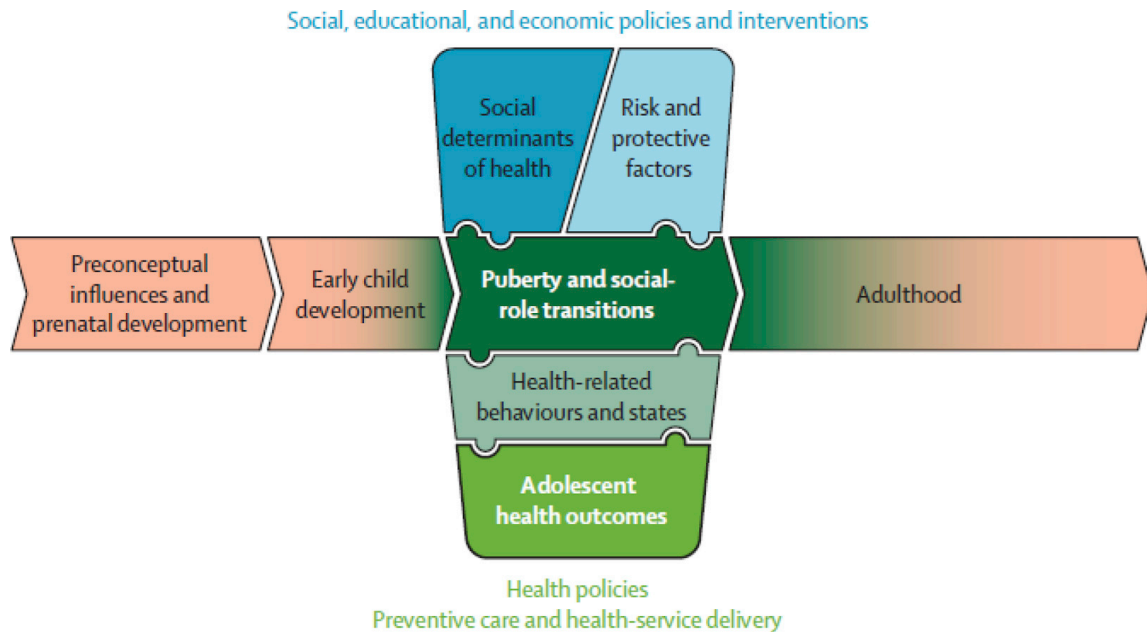


Figure 2.1: Conceptual framework for adolescent health (Sawyer et al., 2012)

2.1.2 Youth mortality and health-related states and behaviours

During adolescence and young adulthood, mental health disorders and a range of health and lifestyle behaviours and habits emerge and contribute to the burden of disease, through adolescence and into adulthood (Sawyer et al., 2012). As discussed below in more detail, these behaviours and habits are likely to co-occur in young people (Brenner & Collins, 1998; Burnett-Zeigler et al., 2012; Duberstein et al., 2000; Irwin et al., 1997) and have the potential to adversely affect health and wellbeing (Spring et al., 2012).

The prevalence and experience of mental health disorders and health-compromising behaviours is not homogenous for young people, with key differences occurring in each developmental stage. For instance, young adults aged 18 to 25 have a higher prevalence of serious psychological distress and substance use compared to younger adolescents aged 12 to 17 and adults aged 26 to 34

(Neinstein, 2013; Stroud, Walker, Davis, & Jr, 2015). This young adult population is also more likely to report not having a regular doctor and having a weaker sense of belonging to a local community, likely due to social isolation and to stress from work and study commitments, compared to other age groups (Marshall, 2011). In addition, relative to younger children, the health status of adolescents has improved little over the past five decades (Viner et al., 2011), suggesting a need for more effective responses by health services to ensure health gains in childhood are continued into adult life.

Mortality Analysis of worldwide data suggests that mortality rates rise significantly from early adolescence (10 to 14 years) to young adulthood (20 to 24 years), with causes varying by geographical region and sex (Patton et al., 2009). For example, rates of maternal mortality are very low in high income countries and high in low income countries, such as Bangladesh and Haiti, while death from violence is highest among males and in Latin America and eastern Europe (Patton et al., 2009). In Australia, the leading cause of death for young people of both sexes aged 15 to 24 is suicide followed by traffic accidents and accidental poisoning, with the rate for young males approximately two times that of females for each cause (Australian Bureau of Statistics, 2016a). Meanwhile, the leading cause of death for Indigenous young people is also suicide; the rate being four times the rate of non-Indigenous young people (Australian Bureau of Statistics, 2016a). Recent research has found that adolescents with a friend or family member who had attempted or completed suicide are at increased risk of attempted suicide and self-harm (Chan et al., 2018).

Mental health disorders and substance use. The highest incidence of mental health problems occurs during adolescence. One in four young people experience a mental health disorder, most commonly anxiety disorders, substance use disorders and affective disorders (Kessler et al., 2005). Kessler et al. estimate that 75% of people with a mental health disorder experience its onset by 25 years of age (Kessler et al., 2005). In addition, the rates of psychological stress for adolescents have remained high over the last decade (Bor, Dean, Najman, &

Hayatbakhsh, 2014), suggesting that new strategies may be needed for early identification and intervention with these disorders.

The risk and protective factors for developing a mental health disorder are complex and multi-factorial, across biological, psychological and social domains (Patel, Flisher, Hetrick, & McGorry, 2007). Mental health disorders are likely to persist throughout the life course (Andrad et al., 2000) and have a significant impact on social and economic outcomes in adulthood (Knapp, McCrone, Fombonne, Beecham, & Wostear, 2002). For example, a large longitudinal study found that those with depression or substance abuse in adolescence had a 20% reduction in yearly income as adults (Smith & Smith, 2010). Furthermore, a report commissioned by the Orygen Youth Health Research Centre concluded that the financial cost of mental illness in 2009 in people aged 12 to 25 was AUD\$10.6 billion, with a further cost of AUD\$20.5 billion due to disability and premature death (Access Economics, 2009). This suggests early identification and intervention has the potential to mitigate long-term costs, which is further supported by a 14-year prospective cohort study of adolescents which found that interventions that identify and shorten the duration of mental disorders in adolescence could prevent morbidity later in life (Patton et al., 2014).

As with mental health disorders, substance use can cause immediate and long-term health and social problems. Although adolescent substance use has decreased substantially over the last two decades (Toumbourou et al., 2018), a significant proportion of young people still report substance use. For example, over one-third (39%) of young people in Australia report drinking alcohol at levels that put them at risk of harm (more than four standard drinks on one occasion, at least once a month), while just over one in ten (11%) report being daily smokers, and one-quarter report using illicit drugs in the previous twelve months (Australian Institute of Health and Welfare, 2016). Problematic substance use co-occurs with range of serious health problems, including depression (Currie et al., 2005), suicidal ideation (Gart & Kelly, 2015), obesity (Huang et al., 2013) and high blood pressure (Oesterle et al., 2004).

Self-harm. Self-harm refers to intentional behaviours that cause harm, irrespective of type of motive or the extent of suicidal intent (Hawton, Saunders, & O'Connor, 2012). There are a complex range of contributors to self-harm including genetic, psychological, familial, social and cultural factors (Hawton et al., 2012).

Approximately one in ten (10.9%) young Australians aged 12 to 17 years report having ever deliberately harmed themselves, three-quarters of whom (8% of all young people) self-harmed within the previous 12 months (Lawrence et al., 2015). Self-harm is linked with female gender, depressive symptoms, anti-social behaviour, and alcohol use in adolescents (Heerde et al., 2015). The majority of young people who self-harm do not seek help (Michelmores & Hindley, 2012), although recent analysis of data has shown an increased rate of presentations to hospital emergency departments (Perera et al., 2018) suggests that appropriate opportunistic screening may be beneficial to facilitate early intervention.

Eating disorders. Eating disorders typically have their onset during adolescence, with young females and those living in western society more likely to develop these (Fairburn & Harrison, 2003; Patton, Selzer, Coffey, Carlin, & Wolfe, 1999). Eating disorders affect a relatively small proportion of adolescents, with lifetime prevalence being 0.3%, 0.9% and 1.6% for anorexia nervosa, bulimia nervosa, and binge-eating disorder respectively (Swanson, Crow, Le Grange, Swendsen, & Merikangas, 2011). Despite this small incidence, eating disorders can have a significant impact and high levels of both mortality, particularly anorexia nervosa (Smink, Van Hoeken, & Hoek, 2012), and comorbidity, such as mood disorders and substance use (Lewinsohn, Striegel-Moore, & Seely, 2000).

Sexual health and activity. The 2014 National Survey of Secondary Students and Sexual Health found that a minority (13%) of sexually active Australian adolescents did not use some form of birth control. However, those who did use contraception used the less reliable methods, with 58% reporting using a condom the last time they had sex, and 15% using the less effective withdrawal method (Mitchell, Patrick, Heywood, Blackman, & Pitts, 2014). In contrast, few report using the most effective long acting and reversible contraception (LARC), such as

contraceptive implant (6%) (Mitchell et al., 2014) which is unfortunate given that LARC usage is associated with decreased teenage pregnancy rates and abortion rates in females aged under 20 years (Connolly, Pietri, Yu, & Humphreys, 2014). Approximately one in ten (10.4%) report having no sex education at school (Mitchell et al., 2014). Disturbingly, one-quarter (25%) of sexually active year 10 to 12 students report having had an experience of unwanted sex (Mitchell et al., 2014). These figures raise concerns about unprotected sexual activity leading to unplanned pregnancy but also sexually transmitted infection (STI).

The rate of teen births in Australia is declining and sits at around 2.4% of all births (Australian Bureau of Statistics, 2017). Teenage pregnancy is associated with greater likelihood of single parenthood, greater poverty, and less parental education, contributing to poorer child outcomes (Patton et al., 2018). The rate of abortion amongst teenagers is difficult to determine in Australia because national records are not kept but South Australian data indicates that 53.8% of pregnancies for young women aged 13 to 19 years end in abortion (Marino, Lewis, Bateson, Hickey, & Skinner Prof., 2016). Countries where sex is more openly discussed and taught within school, such as the Netherlands, have the lowest rates of unplanned teenage pregnancy (Ferguson, Vanwesenbeeck, & Knijn, 2008).

Over 50% of chlamydia and 30% of gonorrhoea diagnoses are in young people aged under 25 (Department of Health, 2018). Both chlamydia and gonorrhoea have considerable long-term health consequences particularly for women, and if left untreated can cause chronic pelvic pain, ectopic pregnancies, and infertility (Reekie et al., 2018). General practice screening guidelines exist in Australia for all sexually active young people under the age of 25 years (Royal Australian College of General Practitioners, 2012) yet an increase in women presenting with gonorrhoea-related pelvic inflammatory disease to emergency departments, particularly women under 25 years, suggests that implementation in general practice is low, indicating the importance of systematic screening practices in primary care (Reekie et al., 2018).

Obesity and being overweight. In Australia, 22% of young people are overweight and 15% obese (Australian Institute of Health and Welfare, 2016). Being obese or overweight are health states that negatively impact young people's wellbeing and increase the risk of adult obesity (Patton et al., 2011), chronic conditions such as Type 2 diabetes and cancer (Biro & Wien, 2010), and mood disorders (Sanderson et al., 2011). Further, obese young people rate their health-related quality-of-life lower than healthy young people, and at similar levels as those diagnosed with cancer (Schwimmer, Burwinkle, & Varni, 2003). While the causes of obesity are complex, excessive intake of sugars, salts and unhealthy fats and reduced physical activity are significant factors (Patton et al., 2016). Approximately half (48%) of Australian young people aged 18 to 24 do not meet the physical health guidelines, which recommend at least 150 minutes of physical activity over 5 or more sessions every week, and although 46% of 15 to 17 year olds eat the recommended 2 daily service of fruit, only 4% consume the recommended 5 serves of vegetables a day (Australian Institute of Health and Welfare, 2016).

2.1.3 Risk and protective factors

In addition to health-related behaviours and states, a range of risk and protective factors influence young people's health and wellbeing. As explored below, individual, peer and family relationships and education and employment all play a crucial role in young people's health and their transition to adulthood (Viner et al., 2012).

Individual factors (sexual orientation and gender identity). Adolescence and young adulthood is typically a time when sexual orientation and gender identity is explored and defined. Young people who identify as lesbian, gay, bisexual, transgender, intersex, or queer (LGBTIQ) are not inherently disordered, but are often marginalised and are at greater risk of health-compromising behaviours and mental health disorders. Young people who identify as lesbian, gay or bisexual have substantially higher rates of substance use (Marshall et al., 2009), depression (Lucassen, Stasiak, Samra, Frampton, & Merry, 2017), suicide (Russell & Joyner,

2001), homelessness, and verbal, physical, and sexual harassment and violence (Coker, Austin, & Schuster, 2010).

Transgender and gender nonconforming people are those whose experience of their gender does not match their birth-assigned sex (Eisenberg et al., 2017). While only a small proportion (0.17-1.3%) of young people identify as transgender (Connolly, Zervos, Barone, Johnson, & Joseph, 2016), this population reports suicidal ideation three times higher than youth whose assigned sex at birth aligns with their gender identity (Eisenberg et al., 2017). Transgender young people also have higher rates of substance use, eating disorders, unsafe sexual practices, mood disorders, and bullying (Connolly et al., 2016; Eisenberg et al., 2017).

Peer Relationships. Peer relationships play an increasingly important role in young people's social and emotional development through adolescence and young adulthood. A survey of a randomly selected nationally representative school-based sample of 11 to 17 year old students in Australia found that 13% had experienced bullying in the past 12 months (Thomas et al., 2017), while a review of the literature found 23% of children and young people report being cyberbullied (Hamm et al., 2015). Those who experience bullying have higher levels of psychological distress, emotional and behavioural problems, substance use, and higher rates of self-harm and attempted suicide (Thomas et al., 2017). In the longer term, being bullied in adolescence is associated with mental health problems in adulthood (Sigurdson, Undheim, Wallander, Lydersen, & Sund, 2015).

In addition to bullying, approximately 1 in 5 young people aged 12 to 21 report being the victim of psychological violence and 1 in 10 report physical violence within dating or romantic relationships (Halpern et al., 2001; Howard et al., 2013). Exposure to violence is, in turn, associated with increased rates of depression (Dunn et al., 2012), suicidal ideation and being violent (Howard et al., 2013), and substance use (Wright et al., 2013). However, most young people experiencing dating violence do not seek help (Ashley & Foshee, 2005).

Education and employment. Like peer relationships, education plays an important role in young people's social and emotional development. Indeed, stronger connection with their school, in conjunction with aspects of the school environment such as leadership and safety, positively and directly affect a range of young people's health behaviours and outcomes, including reducing drug use and violent behaviour (Flay, Graumlich, Segawa, Burns, & Holliday, 2004; Resnick et al., 1997). However, education can also have a negative impact on many young people, with a large survey of 24,055 young Australians aged 15 to 19 finding that 35.6% are either extremely or very concerned with school or study problems (Bullock et al., 2017). High academic stress is linked with lower physical and mental wellbeing, and with substance use (Lemma et al., 2014). Furthermore, a large study of health and education data of young people between 1990 and 2014 in the United Kingdom found that for those young people who received a diagnosis of depression, their educational achievement had already been declining for a number of years (Rahman et al., 2018). This suggests that screening should include questions on education and employment as an important indicators of health and wellbeing.

Employment can have both a positive and negative effect on adolescents. When moderate in intensity and steady in duration, employment can provide young people with increased agency, responsibility, job satisfaction, and time management skills (Mortimer, 2010). The unemployment rate for young people in Australia aged 15 to 24 years was 12.7% in February 2018 and, although lower than the 40 year high of 19.7% in 1992, is significantly higher than the unemployment rate of 4.9% for the whole population (Australian Bureau of Statistics, 2018b). Young people who are not working, or are working more than a few hours per week and studying, are at greater risk of mood disorders and substance use, compared to those only studying (Axelsson & Ejlertsson, 2002; Wu et al., 2003).

Home and family. Family connectedness protects adolescents against emotional distress, suicidal thoughts and behaviours, violence, substance use and early age of

initial sexual experience (Resnick et al., 1997). A study by Rhodes and colleagues found that family norms were related to both current risk behaviour and intentions to engage in risky behaviours during the next six months (Rhodes, Ewoldsen, Shen, Monahan, & Eno, 2011). In addition, living with domestic violence, in the form of emotional, physical or sexual abuse, increases young people's risk of developing emotional and behavioural problems, which can endure even after interventions are made to ensure safety (Holt, Buckley, & Whelan, 2008).

Homelessness. Homelessness can take different forms, including sleeping outside, staying in supported accommodation, and staying temporarily with others. According to the 2016 Australian Census, 24% of homeless people were aged 12 to 24 years (Australian Bureau of Statistics, 2018a) and nearly one in seven young people report spending time away from home in the last three years because they felt they couldn't go back (Mission Australia, 2016). The reasons for homelessness are multi-dimensional and complex; they include violence and family breakdown, mental health and substance abuse, lack of affordable housing, and leaving foster care (Commonwealth Government, 2008). Youth homelessness co-occurs with substance use (Baer, Ginzler, & Peterson, 2003), mental health disorders (Kamieniecki, 2001) and violent behaviour (Baron, 2003). Young homeless people are likely to experience a range of other health issues, including malnutrition, dental problems, and sexually transmitted infections (National Youth Commission, 2008). Research also suggests that the longer people are homeless, the more difficult it is to find them secure housing (Johnson & Chamberlain, 2008), suggesting that early identification and intervention is important.

2.2 Help-seeking, health prevention and early intervention for mental health problems and health-compromising behaviours

2.2.1 Help-seeking

Despite the high prevalence and co-occurrence of mental health problems and health-compromising behaviours, a large proportion of young people do not seek professional help for these issues. A large national survey of Australian young people found that while the rate of service use has increased substantially, just over a one-third (34.9%) of 12 to 17 year-olds with a mental health disorder had not used services for emotional and behavioural problems (Johnson et al., 2016). Young people least likely to seek help are those who are low in emotional awareness and poor at managing their emotions, are younger, male, or from an ethnic minority (Ciarrochi, Deane, Wilson, & Rickwood, 2002; Sen, 2004; Yap, Reavley, & Jorm, 2013). Indeed young people are more likely to seek help from close friends and family and to use self-help interventions than to seek professional help (Ashley & Foshee, 2005; Reavley, Yap, Wright, & Jorm, 2011).

There are a range of underlying barriers and facilitators that influence whether young people seek help for health issues. The main help-seeking barriers for young people are: feeling embarrassed or ashamed; not recognising symptoms are problematic; difficulties in communicating their symptoms; no, or negative past help-seeking experiences; lack of accessibility; suicidal thoughts and depressive symptoms; and, a belief that they should resolve their own problems (Rickwood, Deane, Wilson, & Ciarrochi, 2005; Salaheddin & Mason, 2016). Fear of lack of confidentiality, especially from parents, cost, and stigma, such as being recognised in a clinic waiting room, are also barriers for young people (Tylee et al., 2007). In addition, a recent systematic review found that these barriers were exacerbated for some marginalised young people, such as cost for low income young people, and language and cultural issues for refugee young people (Robards, Kang, Usherwood, & Sancu, 2018). Facilitators to help-seeking include positive past

experiences, social support or encouragement from others, confidentiality and trust in the provider, and ease of articulating feelings (Gulliver, Griffiths, & Christensen, 2010). One way to mitigate the barriers may be to integrate help-seeking, and subsequent early intervention and health promotion opportunities within young people's existing routine health appointments and with trusted health professionals, such as in general practice; which I will explore in more detail below.

2.2.2 Prevention, early intervention and health promotion

Prevention, early intervention, and health promotion initiatives and policies shift the focus of healthcare to not only treating and minimising illness, but also preventing illness and promoting healthy lifestyle and behaviours. In 1994, the National Academy of Medicine, a leading national health research and policy organisation in the United States, developed a framework to classify mental health interventions for mental disorders that covers a spectrum of prevention, treatment, and continuing care (Mrazek & Haggerty, 1994). In this model, as shown in Figure 2.2, prevention occurs before the initial onset of a disorder and can be classified into: 1. universal prevention, targeted to the whole population group; 2. selective prevention, targeted to those who have a higher risk of developing disorders; and, 3. indicated prevention, targeted to those at high risk who have minimal but detectable illness symptoms or predisposition. Treatment consists of case identification, early treatment and standard treatment, including interventions to reduce progression and severity of any disorder as well as to prevent future reoccurrence (Mrazek & Haggerty, 1994).

In 2000, Mrazek and Haggerty's mental health intervention spectrum was adapted by the Commonwealth Department of Health and Aged Care to incorporate both early intervention and health promotion. As shown in Figure 2.2, early intervention overlaps with both prevention and treatment interventions, while mental health promotion occurs throughout the spectrum (Commonwealth Department of Health and Aged Care, 2000). In this framework, early intervention is the early identification of "emerging signs and symptoms of mental health

problems and mental disorders to enable timely, effective and appropriate treatment in order to prevent diagnosable illness and reduce the disability associated with symptoms” (Commonwealth Department of Health and Aged Care, 2000). Across the national and international health research and policy sectors, “early intervention” is a term that is used not just for mental health but for a range of physical and health issues and lifestyle behaviours, including sexual activity (Guilamo-Ramos et al., 2011), and eating disorders (Bauer, Moessner, Wolf, Haug, & Kordy, 2009). It is with this broader scope of health promotion to include general mental and physical health that I use the term *early intervention* in this thesis.

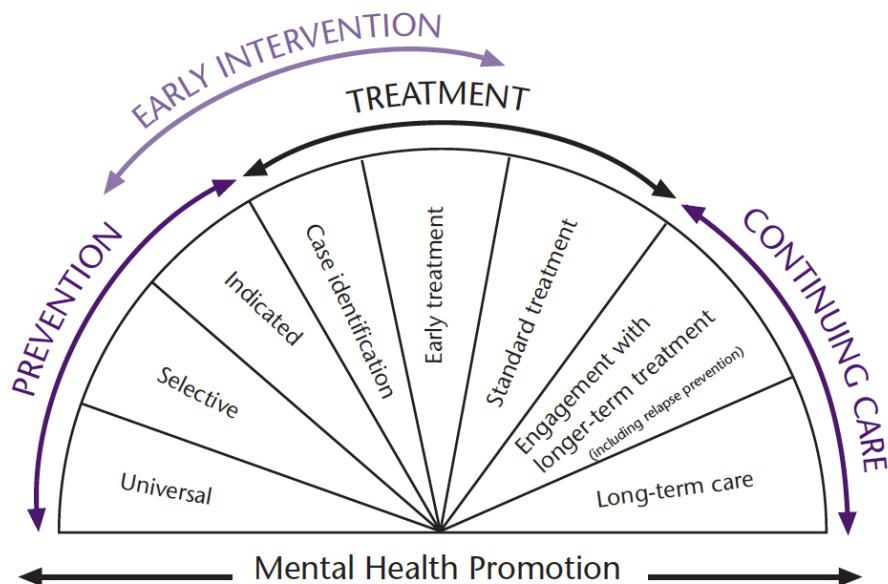


Figure 2.2: The spectrum of prevention and interventions for mental health problems from ‘Promotion, prevention and early intervention for mental health’ (Commonwealth Department of Health and Aged Care, 2000), adapted from Mrazek & Haggerty (1994)

That it is incorporated across the spectrum of interventions reflects the potential of health promotion to improve health and wellbeing of the community. A key

driver of health promotion into research and policy has been the Ottawa Charter for Health Promotion, developed by the World Health Organization in 1986. The Ottawa Charter defines health promotion as “the process of enabling people to increase control over, and to improve their health” (World Health Organization, 1986). This Charter frames health as including social and personal factors, not just physical capacities, and mandates that health services reorientate to deliver greater health promotion activities in addition to treating ill health (World Health Organization, 1986).

Further, there is sound evidence to support the effectiveness of prevention and early intervention in improving the outcomes of young people across a range of mental health issues and health-compromising behaviours. A review of the evidence by Catalano and colleagues found that universal, selective and indicated prevention interventions targeted at young people leads to improvements in a range of health outcomes and behaviours, including a reduction in teenage pregnancies, alcohol use, violent car crashes and school dropout (Catalano et al., 2012). In addition, meta-analyses of the literature have concluded that early intervention can reduce substance use (Carney & Myers, 2012) and improve clinical outcomes for early-phase psychosis (Correll et al., 2018) in adolescents. However, there are two important limitations of all these studies: firstly, they focus on individual health issues, rather than the multiple issues and behaviours that, as described above, typically co-occur in young people; and, secondly, none of the included studies were conducted in the general practice setting, which, as I discuss below, is a particularly suitable setting in which to provide early identification and intervention for young people. Thus, there is a need for a systematic review of the literature investigating whether identification and early intervention of multiple mental health issues and health-compromising behaviours in general practice leads to better health outcomes.

2.3 General practice

2.3.1 What is general practice?

In the Declaration of Alma-Ata made at the International Conference in Primary Health Care in 1978, the World Health Organization defined primary health care as:

the first level of contact of individuals, the family and community with the national health system bringing health care as close as possible to where people live and work, and constitutes the first element of a continuing health care process. (World Health Organization, 1978, p. 2)

General practice is a primary care setting where specialist trained medical doctors (GPs) and nurses provide front line health care to individuals from cradle to grave. GPs support people “across the fields of prevention, diagnosis, cure, care, and palliation, using and integrating the sciences of biomedicine, medical psychology, and medical sociology” (Olesen, Dickinson, & Hjortdahl, 2000). Greenhalgh (2007) identifies eight key features of contemporary general practice: a multi-professional team; being proactive as well as reactive; having both a population and individual focus; understanding and integrating the social and cultural context of illness; having an advocacy role; a multiple services model with multiple interfaces; and patients being central in their own care (Greenhalgh, 2007). Hence preventive and early intervention models of care fit very well within the general practice remit.

2.3.2 General practice system in Australia

Although relevant also to overseas primary care systems, the focus of this thesis is on the Australian general practice setting, where the health system is a mix of the public national health system, predominantly used in the United Kingdom, and the privately funded system, predominantly used in the United States. Central to general practice in Australia is the Medicare system, a compulsory, universal health cover for all Australians funded through the taxation system via a Medicare Levy of 2.0% of annual taxable income, with a further surcharge of 1.0-1.5% for

single taxpayers earning over AUD\$90,000 and families earning over AUD\$180,000 (Australian Institute of Health and Welfare, 2016). This means that patients can access 'bulk billing', whereby a practice bills Medicare directly for any service the patient receives. In addition, many practices also charge patients a variable co-payment amount for services, with the average out-of-pocket cost to visit a GP being AUD\$37.39 (Royal Australian College of General Practitioners, 2018).

Although general practices in Australia are predominantly privately-owned businesses, the Australian Government's Medicare system subsidises a range of services provided during consultations through the Medicare Benefits Schedule (MBS). The MBS covers a wide range of important services, such as after-hours care and early intervention for children with a disability (Australian Government, 2013). The MBS currently funds preventative services targeted to the following populations: people aged 45 to 49 at risk of developing a chronic illness or Type 2 diabetes; people aged 75 and older; permanent residents of aged care facilities; those with an intellectual disability; Aboriginal and Torres Strait Islanders; and refugees. Thus, even though young people are at a developmentally critical time in their lives, when they are particularly at risk of developing long-term health behaviours and conditions, there is currently no allowance in the MBS system for preventative checks. This creates a financial barrier for GPs to provide this service for young people who may seek or require it. Yet in Australia, like other high income countries, most young people attend the GP at least once per year (Tylee et al., 2007), presenting an opportunity for preventively orientated health care. Therefore, any intervention facilitating prevention activities for young people attending general practice needs to be developed to work efficiently within routine acute care consultations if it is to be effective under the current MBS funding arrangements.

The nature and scope of general practice in Australia is ever evolving and expanding in response to the needs of the community and the policies of the government. Managed by the Family Medicine Research Centre at the University of

Sydney, the Bettering the Evaluation and Care of Health (BEACH) Program collected information about clinical practice in general practice in Australia. Although the BEACH program is now defunded, available BEACH data is still contemporary; the most recently released report in 2016 found that between 2006-07 and 2015-16 the proportion of GPs working in practices of 10 or more GPs rose from 16% to 29%. Between this period, the average length of consultations increased slightly (14.1 to 14.9 minutes) while the proportion of consultations with young people aged 15 to 24 years decreased from 9.1% to 7.9% (Britt et al., 2016). Thus GPs see a broad range of the community, from ‘cradle to grave’, with young people making up a relatively small proportion of the overall patient load. This diversity and ongoing evolution of general practice means that policies and interventions with a one-size-fits-all model are unlikely to succeed and more flexible and nuanced approaches are required.

2.3.3 GPs’ role in prevention and early intervention

Health prevention and early intervention is increasingly perceived as a key responsibility of general practice. In 2010, the Commonwealth government released the National Primary Health Care Strategy, the first national policy statement for general practice in Australia, providing a roadmap for future policy, planning and practice (Commonwealth of Australia, 2010). Increasing the focus on prevention was one of four key priority areas for change, along with improving access and reducing inequality, better management of chronic conditions, and improving quality, safety, performance and accountability. Specifically, it recommended ‘more systematic approaches to preventative care with regular risk assessments’ (Commonwealth of Australia 2010, p.12).

Building on the National Primary Health Care Strategy, the National Primary Care Strategic Framework was released in 2013 as a nationally agreed policy developed by Commonwealth, State and Territory Health Departments. It aimed to improve health care for all Australians, keep people healthy, prevent illness, reduce the need for unnecessary hospital presentations, and improve the management of complex and chronic conditions. One of its four strategic outcomes was an

increased focus on health promotion, prevention, screening and early intervention. The Framework recommended targeting known lifestyle-related health risk factors, such as alcohol consumption, physical inactivity, and unsafe sexual practices (Commonwealth of Australia, 2013), and also recommended working with the Australian National Preventative Health Agency (ANPHA), formed in 2011, to provide national capacity to drive preventative health programs and policies. Unfortunately, the Federal Government announced the closure of ANPHA as part of the 2014 Federal Budget, with the Agency's functions transferred to the Department of Health. The closure of the ANPHA suggests that due to changes in policy and a reduction of funding for preventive activities, general practice may need to play a greater role in delivering preventative health care services to young people.

Supporting the implementation of the National Primary Health Care Strategic Framework, the Australian Government released the Framework for Child and Youth Health in 2015 (Australian Health Ministers' Advisory Council, 2015). This National Primary Health Care Strategic Framework identifies the key strategic priorities for child and youth health in Australia for the next ten years. It aims to articulate a national vision for young people to be resilient, thriving and healthy. Prevention and early intervention are guiding principles of this Framework and are highlighted as best clinical practice to enable young people to achieve optimal health outcomes. In this Framework, timely and effective primary care is identified as a key strategy to reduce hospital admissions, by managing behavioural and lifestyle changes and reducing chronic illnesses and preventable injury, including diabetes, self-harm and obesity (Australian Health Ministers' Advisory Council, 2015).

2.4 Young people and general practice

2.4.1 Young people's attendance at primary care

Although of all patient age groups, young people aged 10 to 19 years are the lowest users of general practice (Booth, Knox, & Kang, 2008), most young people aged 15

to 24 (75.8%) do attend general practice within a 12-month period, with a further 13.5% having attended between 1 and 2 years previously (Australian Bureau of Statistics, 2013). The most common reason young people attend general practice in Australia is for physiological reasons (Booth et al., 2008; Tylee et al., 2007); very few discuss preventive health issues, such as increasing physical activity (3%), healthy eating (7.6%), reaching a healthy weight (6.2%), safe sexual practices (6.1%) and drinking alcohol in moderation (1.4%) (Australian Bureau of Statistics, 2013). Despite this, a large study of 6,728 young people in the United States found that a majority report wanting to discuss a range of sensitive issues with their health care provider, including drugs (65%), cigarette smoking (59%) and healthy eating (57%) (Klein & Wilson, 2002).

In addition to the general barriers to help-seeking described above, young people have reported there are a range of reasons not discussing sensitive issues specifically when they see their GP or health care provider. Young people report concerns about embarrassment in disclosing health concerns and a presumption that GPs can only help with physical, not mental, health issues (Bernard et al., 2004; Booth et al., 2004; Leavey, Rothi, & Paul, 2011; Tylee et al., 2007). Another potential major barrier at health care consultations is not having a private and confidential consultation when a parent or guardian is present (Gulliver et al., 2010), which has an impact on disclosure as young people who spend time alone with their doctor are more likely to discuss sensitive issues (Fairbrother et al., 2005). Further, the identification of emotional distress by GPs has been most highly correlated with young people recognising and expressing they have a problem (Haller et al., 2009), suggesting that screening may enable young people to acknowledge and articulate concerns.

More than 80% of primary care providers agree that they should be responsible for identifying mental health, substance use and behaviour problems in young people (Stein et al., 2008). However, primary care providers report a range of significant barriers to integrating prevention and early intervention in their care of young people. These barriers include a lack of time to screen multiple health areas

(Yarnall, Pollak, Østbye, Krause, & Michener, 2003), feeling uncomfortable raising sensitive issues that are not the presenting issue (Henry-Reid et al., 2010), lack of awareness or skill (Chung, Lee, Morrison, & Schuster, 2006), and a lack of confidence and self-efficacy in managing issues with young people (Jarrett, Dadich, Robards, & Bennett, 2011). The disparity between desire and action, suggests that an intervention is required to ensure preventive health activities take place.

2.4.2 Young people's experience of care in general practice

Despite young people's regular attendance at general practice, it is only relatively recently (over the last decade or so) that there has been a growing body of research into young people's experience of care in general practice. A systematic review conducted by Ambresin et al. (2013) investigated young people's perspectives and concluded that eight core domains of health care are central to young people's positive experience of general practice ('youth-friendly care'): accessibility; staff attitude (respectful, honest, trustworthy); communication; medical competency; guideline-driven care (including confidentiality, autonomy); age appropriate environments; youth involvement in health care; and health outcomes (Ambresin et al., 2013). Similar results were found in a systematic review of studies conducted in the United Kingdom, which concluded that five aspects of general practice provision are important to young people: accessibility and availability; confidentiality; communication; continuity of care; and behaviours and attitudes of the health care professionals (Davey et al., 2012).

There is also evidence to suggest that there is a relationship between youth-friendly care and health outcomes in young people. A large study of adolescents aged 11 to 15 years in the United Kingdom investigated young people's experience of care with their GP. This study found that, after adjusting for ethnicity, age, gender, and family affluence, young people who were at increased risk of self-harm, low mood and sleep problems were more likely to rate their GP experience poorly (Yassaee et al., 2017).

Like youth-friendly care, patient-centred care is a conceptual framework proposing that patients need to be actively engaged in their care to enable optimal therapeutic benefits (Epstein & Street, 2011). Although patient-centredness is a concept that has been around for some time, there has been a lack of clarity and cohesion on its definition and measures (Hudon, Fortin, Haggerty, Lambert, & Poitras, 2011). However, two main conceptual frameworks of patient-centredness have emerged, both with common domains: therapeutic alliance, bio-psychosocial perspective (an explanatory model that includes social and psychological factors); and shared power and responsibility, and patient as a person (understanding the personal meaning of illness for each patient) (Little et al., 2001; Mead et al., 2002). A study by Little et al. (2001) measured patients' perceptions of patient-centredness and the relation these perceptions had to outcomes. It found that patients want a patient-centred approach and without it they are less satisfied, less enabled, and may suffer greater symptom burden (Little et al., 2001b).

Although there is limited research in youth populations, evidence suggests that young people prefer a patient-centred approach to their health care. A study by Alden and colleagues surveyed university students in both the United States and Japan on their preferences for decision making in primary care. They found that young people in both countries preferred taking an active partnership role in decision making over a more passive role (Alden, Merz, & Akashi, 2012). Despite this preference, most young people do not receive patient-centred care. A large cross-sectional study by Toomey and colleagues surveyed 4,105 adolescents about whether they receive patient-centred care. They found that only 47% of young people reported receiving patient-centred care. Reception of patient-centred care in this study was associated with higher ratings of quality care, including having talked about health behaviours, having a private conversation with their doctor, and lower likelihood of self-reported unmet need and having an untreated health problem (Toomey et al., 2016).

2.5 Screening in general practice

2.5.1 What is screening in general practice?

Screening is a useful way for health providers to identify areas of concern and to provide appropriate prevention and early intervention, as per Mrazek and Haggerty's (1994) conceptual model described above. The World Health Organization defines screening as a simple and rapid method of identifying 'unrecognized disease or defect' (Wilson & Jungner, 1968), with positive or suspicious findings followed up by subsequent diagnosis and appropriate treatment. Within the time-poor general practice setting, screening has many advantages, such as enabling GPs to normalise sensitive issues, guide discussion about risky behaviour, and promote healthy lifestyle behaviours (Fothergill et al., 2013).

There are many screening tools for young people that focus on individual health domains, such as eating disorders (Mond et al., 2004), substance use (Knight et al., 2002), depression (Zuckerbrot et al., 2007), physical activity (Prochaska et al., 2001), and suicide risk (Wintersteen, 2010). However, these single domain tools have a major disadvantage compared to multidimensional tools in that they do not address the tendency for co-morbidity and co-occurrence of risk behaviours and mental health problems in young people (Brenner & Collins, 1998; Burnett-Zeigler et al., 2012; Duberstein et al., 2000; Irwin et al., 1997). Thus, screening tools that include multiple domains are more appropriate and more likely to provide a comprehensive and accurate snapshot of health and wellbeing.

Peak professional bodies both overseas and in Australia recommend the routine screening of young people in primary care (American Academy of Pediatrics, 2017; Royal Australian College of General Practitioners, 2012). In the United States the American Academy of Pediatrics, through their Bright Futures Guidelines, recommend that adolescents are screened annually for psychosocial and behavioural issues, drug use, depression, sexually transmitted infections, and body mass index (American Academy of Pediatrics, 2017). In Australia, the Royal

Australian College of General Practitioners (RACGP), the peak professional body for GPs, has developed the 'Guidelines for Preventive Activities in General Practice' (Royal Australian College of General Practitioners, 2012). These guidelines recommend regular screening of young people across multiple domains using the HEEADSSS framework (Goldenring & Rosen, 2004; Klein, Goldenring & Adelman, 2014). This framework covers the range of health, social, psychological and physiological issues and behaviours contributing to the major burdens of disease for young people: Home environment; Education and employment; Eating; peer-related Activities; Drugs; Sex and sexuality; Suicide/depression; and Safety, for example from injury and violence, ultraviolet exposure, and vaccine preventable diseases.

While the American Academy of Pediatrics recommend annual screening of young people, the RACGP's recommended frequency of screening for young people varies depending on the issue; screening is recommended at every visit for depression, suicide and nutrition, every two years for exercise, smoking and body mass index, and opportunistically for violence and tobacco use (Royal Australian College of General Practitioners, 2012). There is a lack of evidence supporting the determination of how often young people should be screened for various issues. In addition, unlike in the United States, where private health insurance funds annual screening for young people in dedicated 'well-child' preventive appointments, there is currently no funding system in Australia, either through private insurance or the Medicare Benefits System, to support preventive health and lifestyle screening of young people. For this reason, screening young people in Australian general practice occurs opportunistically at routine acute care visits, with evidence from the United States suggesting screening opportunistically may actually be more effective at identifying issues than screening conducted at well-child appointments (Borowsky, Mozayeny, & Ireland, 2003).

2.5.2 Benefits and risks to screening young people in general practice

Young people and GPs alike report that screening tools provide an opportunity to discuss sensitive topics that would not normally be mentioned in a typical

consultation (Brown & Wissow, 2009; Fothergill et al., 2013). One advantage of screening is the speed with which areas of risk can be identified, allowing more time for further investigation with diagnostic tools and interventions. The discussion of sensitive topics is, in turn, associated with young people perceiving their GPs and treatments more positively. For example, young people who have been screened report that the practitioner understood their problems, eased their worries, gave them control over their treatment and were more likely to take on an active role in treatment when the visit included the discussion of sensitive health topics (Brown & Wissow, 2009).

In addition, screening may improve rates of disclosure and increase engagement between young people and health professionals. A systematic review by Bradford and Rickwood (2012) investigated 31 different multidimensional psychosocial assessment tools and found that young people who completed holistic health assessments trusted their clinician more, and were more likely to talk to their clinician about sensitive issues in the future. Other benefits include the potential to increase recognition of health problems that may otherwise go undetected, referrals to specialty care (Husky et al., 2011), and the provision of health education materials (Klein et al., 2001).

There have been few studies that explore the impact of screening young people in general practice on their health outcomes. One systematic review of clinical trials by Moyer et al. found that there was limited evidence to support screening and preventive interventions in young people and called for more studies in the area (Moyer & Butler, 2004). A more recently published systematic review found that interventions for multiple risk behaviours were effective and comparable to those interventions targeting single risk factors (Hale, Fitzgerald-Yau, & Viner, 2014). However, this review excluded terms for primary care and did not include young adults aged 20 to 25 who, as mentioned above, have a higher prevalence of significant health risks compared to younger adolescents (Neinstein, 2013). One subsequently published randomised control trial by Sanci and colleagues showed clinician training, basic paper-based screening tools, and office procedures can

increase clinician's discussion of multiple health risks, along with small reductions in incidence of illicit drug use and unprotected sex (Sanci et al., 2015). Given that preventive care of young people continues to be recommended as best practice to primary care practitioners (American Academy of Pediatrics, 2017; Royal Australian College of General Practitioners, 2012) and central to well-care visits, there is a need to systematically review the current evidence in this setting.

While there are clear benefits to screening, there may also be some risks, with a lack of examination of potential risks. The United States Preventive Service Taskforce Guidelines have concluded that there is currently insufficient evidence of the harms and benefits to recommend screening young people for suicide risk (LeFevre, 2014), and adolescents for child mistreatment (Moyer, 2013a) and alcohol misuse (Moyer, 2013b). More research into the potential harms of screening is needed to ensure young people receive effective and evidence-based care.

There is a need to further understand young people's experience of screening and the longer-term implication for practice and health outcomes. This includes whether young people would be willing to be screened on a regular basis and, if so, how often. Although one study in a hospital-based adolescent and young adult clinic found that 84% of young people would be willing to complete a screening tool once a year, participants responded before their consultation (Hassan et al., 2013). It is possible their responses might be different after the experience of using the tool with their practitioner, or at a practice not servicing only youth.

2.5.3 Barriers to screening young people in general practice

National professional guidelines in both Australia and the United States recommend regular screening of young people in general practice for a range of mental health issues and health-compromising behaviours (American Academy of Pediatrics, 2017; Royal Australian College of General Practitioners, 2012). However, this guideline is not being followed in routine practice; the rate of screening for young people in this setting remains low (Hassan et al., 2013; Klein &

Wilson, 2002). For example, a large survey of adolescents aged 13 to 17 found only approximately one-third were screened for emotional health in primary care (Ozer et al., 2009). Another large study of high school students who had attended primary care found that only 42.8% of sexually active females and 26.4% of sexually active males had been screened for STIs in the previous 12 months (Burstein, Lowry, Klein, & Santelli, 2003).

Given the low rate of screening, it is not surprising that GPs report several barriers in dealing with sensitive issues in the health care setting. GPs report a lack of time, a lack of training, and a reluctance to ask young people about sensitive issues as major barriers to screening. A study by Yarnall et al. (2003) calculated the actual time required to provide all services recommended by the United States Preventive Services Task Force for adults and young people in a general practice setting. To comply with these guidelines for all patients, it would take up to 7.4 hours of GPs' time per working day. The authors estimated the time required to screen and deliver preventive services for people aged 24 years and under was 36.6 minutes per patient per year (Yarnall et al., 2003). Assuming a young person attends one primary care visit each 12 months this is well above the average consultation length in Australia of 15 minutes (Britt et al., 2016).

A lack of training and unwillingness to discuss sensitive issues are additional barriers preventing GPs screening young people for risk. A survey of 468 paediatricians found that 55% felt that a major barrier to screening was an insufficient training in how to talk to young people about sexually transmitted infections, while 66% were uncomfortable discussing sexual issues with young people and 58% reported a lack of interest in young people's health issues (Henry-Reid et al., 2010). Similarly, an exploratory study with 38 GPs into the barriers to screening for substance abuse in general practice found that apart from lack of time, the main barriers were lack of training in how to manage a positive result (Van Hook et al., 2007). Insufficient training in risk assessment has also been identified as a barrier to screening young people for suicide risk (Diamond et al., 2012).

A practical and critical challenge to using multidimensional screening tools in general practice is ensuring they are systematically used for the target patient group and that identified issues are appropriately followed up by clinicians. As part of their systematic review, Bradford and Rickwood (2012) reported on four studies, each using a different screening tool, where GPs or health care providers failed to discuss with the young person some of the most serious risks they had identified. A subsequently published systematic review found that there was a lack of research examining how clinicians can best use screening results or the process of engaging patients in screening (Wissow et al., 2013).

Clearly, there is a need for more research into ensuring screening tools bridge the barriers for both young people and GPs. A technology-based screening tool, completed prior to the consultation, may be a practical way to address the barriers to screening for health and lifestyle issues. This technology would ensure a comprehensive set of questions across the broad range of mental health and health-compromising issues were systematically presented to young people. The tool would have the potential to enable the focus of the consultation to be on areas of identified concern, while also providing youth-appropriate recommended advice and referrals, to help GPs manage the issues highlighted by screening. This ability to quickly target relevant issues and provide recommended interventions is particularly important given the typical time-limited general practice consultation.

2.6 Technology in general practice

2.6.1 Use of technology in general practice setting

Technology use has become almost universal in general practice, with computers used for administration, such as billing and making appointments, and for clinical purposes. In Australia, almost all (97%) GPs use a computer (Britt et al., 2016). Of the GPs who use a specialised clinical software package on their computer, 98% use it for prescribing, 88% for checking drug interactions, 85% to order laboratory tests, and 78% to run recall systems (McInnes et al., 2006). However, other potentially valuable functionality that may improve clinical outcomes is not usually

utilised during consultations, with only 16% of GPs using computerised information to assess risk factors and 10% for reviewing chronic disease guidelines (McInnes et al., 2006).

Patients are generally positive about the presence and use of computers in their consultations with GPs. As early as 1994, a study found that patients had normalised the use of computers, although they did express a preference for the screen to be visible and shared (Ridsdale & Hudd, 1994). Subsequent studies have explored the influence of computers on doctor and patient positioning and behaviour during consultations. Pearce et al. (2009) conducted an observational study and analysed videotaped consultations from 20 GPs with 141 patients. This study showed that doctors tended to either have the lower part of their body facing the computer or to alternate between orienting to the computer and the patient, while patients tended to either focus on the doctor to the exclusion of the computer or to include the computer as they communicated (Pearce et al., 2009). Extending this research, another study by Montague and Asan (2014) analysed eye gaze patterns and found that doctors spent approximately one-third of consultations looking at the computer (Montague & Asan, 2014). These studies suggest that computers play a major role within a consultation and that even in the early days of computer use patients were keen to have technology shared and integrated into the clinical relationship.

As well as posture and eye gaze, computers may affect the quality of the doctor-patient relationship and health outcomes. Henderson et al. (2010) analysed the BEACH data to compare key service quality indicators between GPs who used computers during consultations and those that did not. They found that there was no evidence to indicate that computers either positively or negatively affected the quality of care GPs provided (Henderson et al., 2010). A subsequent systematic review found that computer use had mainly a neutral or positive effect on patient and providers satisfaction (Buntin et al., 2011), while in one longitudinal study doctors reported an increase in overall satisfaction and communication with computer use (Irani, Middleton, Marfatia, Omana, & D'Amico, 2009).

One negative effect identified is that the doctors may place the demands of the computer system ahead of the needs of the patient (Toerien, 2013). However, doctors are aware of this and report actively using skills to reduce any negative impact, such as separating time spent communicating with patients with computer use (Shachak & Reis, 2009).

Evidence suggests there are other key benefits of incorporating technology within general practice. Chaudhry et al. (2006) conducted a systematic review of 257 studies in both inpatient and outpatient settings investigating the impact of health technology on quality of health care. They concluded that major benefits were increased adherence to guideline-based care and enhanced surveillance and monitoring, particularly for preventive health (Chaudhry et al., 2006). A subsequent literature review found that 92% of articles on health information technology reached conclusions that were positive overall, with benefits including efficiency of care, effectiveness of care, and patient safety and satisfaction (Buntin et al., 2011).

The way in which GPs use computers within consultations is nuanced and sophisticated. GPs adapt their use depending on the content of the consultation, with the average time GPs spent using their computer in consultations with a significant psychological content being approximately half that of those without psychological content (Chan et al., 2008). This suggests that GPs do not make technology the central participant in consultations, but rather use it as an adjunct tool to enhance the consultation.

The extent and manner in which computers are used is up to the GPs discretion and preference. Thus, it has the potential to reinforce traditional power relationships and a GP-centred dynamic. There is currently little research into how new technology, including the use of more mobile types of technology such as tablets or smartphones, may be used in a way that enables the patient to be a more active participant, or partner, in the therapeutic relationship.

2.6.2 Use of screening technology with young people in general practice

Central to any health care consultation is the willingness and ability for patients to disclose health information about themselves to their provider. Disclosure is particularly important in the context of a general practice consultation, where patients are regularly required to share sensitive and personal information about their bodies, thoughts and behaviours to enable doctors to provide informed and appropriate advice and treatment.

Perhaps unsurprisingly, given the ubiquity and integration of technology in their lives, young people may be more likely to disclose on health screening or assessments completed via computer compared to completing self-administrated paper-and-pen formats, particularly on sensitive issues. Indeed, a meta-analysis of the literature found that highly sensitive behaviours, such as illicit drug use and sexuality, are more likely to be disclosed via computer, compared to paper (Gnambs & Kaspar, 2015). This finding is contradicted by one randomized study that found no difference in disclosure between pen-and-paper and computer (Mangunkusumo et al., 2005). However, a possible explanation for this was the lack of highly sensitive questions in the study. For example, questions were asked about alcohol consumption and 'having sex', but not about illicit substance use or other sexual behaviours and preferences.

Young people are also more likely to disclose via technology compared to face-to-face conversation. A systematic review of 15 studies found greater disclosure via online formats compared to face-to-face (Nguyen, Bin, & Campbell, 2012). A subsequent study supports and extends this finding, with young people completing an electronic psychosocial assessment more likely to disclose sensitive issues, including sexual orientation and illicit drug use, and less likely to lie about past experiences of being bullied, substance use, and self-harm (Bradford & Rickwood, 2015). Furthermore, young people prefer initially disclosing health information via technology rather than face-to-face, even when they know the results will be reviewed by their practitioner. A cross-sectional survey with 115 adolescents

reported higher levels of comfort and honesty for being screened in primary care via electronic device compared to paper (Jasik, Berna, Martin, & Ozer, 2016).

There have been a number of theories proposed to explain why technology facilitates disclosure. Theories of most relevance to the one-way, one-off communication of completing technology-based health screening are invisibility, asynchronicity, and minimization of authority as outlined in Suler's (2004) online disinhibition effect. Invisibility refers to the lack of non-verbal reactions that may moderate or inhibit behaviour in face-to-face communication. Asynchronicity is when communication does not occur in real time, when immediate feedback and social norms can prevent disclosure. Disclosure is also facilitated by the minimization of authority where, even if the offline status and power is known, the absence of cues in the online space enables a more peer-like, open communication (Suler, 2004).

There are also a number of important benefits to using a technology-based screening tool for health care practitioners with young people. A mixed methods study of 201 health care practitioners found that using a technology-based screening tool facilitated identification of and communication about risky behaviours that would not occur during a normal consultation (Darling-Fisher, Salerno, Dahlem, & Martyn, 2014). However, there are two characteristics that suggest that this study conducted in the United States does not necessarily represent that of a typical Australian general practice setting, which sees patients from cradle to grave: most participants (76%) worked in school-based clinics; and, a majority (69%) reported that over 50% patients in their clinics were adolescents. In another mixed methods study of adolescents using a technology-based screening tool prior to their consultation, doctors reported that the tool improved visit organization and efficiency (Gadomski et al., 2015). However, this study was conducted in two paediatric primary care clinics in the United States, with young people aged 15 to 19 years. Although practitioners in this study were interviewed after using the tool there was only very limited data published on their experience of using it. Thus, research is needed to understand GPs'

experience of using a technology-based screening tool in the general practice setting.

2.6.3 Technology and patient-centred care

Evidence in non-youth populations suggests that technology-based screening improves patient-centred care. A cluster randomised controlled trial in 18 primary care practices investigating the implementation of a paper or electronic health risk assessment found that, compared to usual care, patients who completed the tool felt that doctors cared more for them and showed more interest in their concerns (Krist et al., 2016). While positive, a limitation of this study was that it did not report on whether there was a difference between paper and electronic formats of the tool. Another study investigated the effect of an electronic pre-visit screening on the care of children aged four to ten completed by their parents in three primary care practices. Parents reported that the electronic screening tool promoted communication and enabled them to normalise sensitive issues, guided and facilitated richer discussion, and increased efficiency (Fothergill et al., 2013).

Although there is growing evidence to suggest that technology-based screening improves patient-centred care in adults (Bertakis & Azari, 2011; Little et al., 2001a; Stewart et al., 2000), evidence is limited for the impact on young people's patient-centred and youth-friendly care. One study by Gadowski et al. undertook an analysis of audiotaped consultations and found that use of technology-based screening tools increased doctor engagement and discussion of psychosocial and mental issues, without affecting partnership or rapport (Gadowski et al., 2015). However, this study did not interview young people about their experience of care. Another study by Olson et al. found that young people using a technology-based screening tool were more likely to feel that they were listened to carefully, that the discussion was confidential, and to feel more satisfied (Olson, Gaffney, Hedberg, & Gladstone, 2009). However, other core elements of youth-friendly care, such as trust and respect, and key elements of patient-centred care, such as health prevention and promotion and shared power, remain unexplored. Both the studies

of Gadowski et al. and Olson et al. were limited to young people aged 19 years or younger and attending well-child visits (Gadowski et al., 2015; Olson et al., 2009).

More evidence is needed about the use of technology-based screening during other occasions of care because well-child consultations are attended by less than 50% of young people (Nordin, Solberg, & Parker, 2010; Tsai, Zhou, Wortley, Shefer, & Stokley, 2014) and are not well-attended by key subgroups of young people such as low income and uninsured (Irwin, Adams, Park, & Newacheck, 2009). Further, as described above, young adults aged 18 to 25 years have a higher prevalence of significant health risks, such as sexually transmitted infections, substance use, and mental health problems (Neinstein, 2013), and have more unmet health needs (Marshall, 2011) compared to younger adolescents. Hence, testing of the utility of technology-based screening is also required in this group.

2.6.4 Young people's use of technology for health

Mobile, Internet-connected technology now plays a large and influential role in young people's lives. This role has been facilitated by the increasing affordability and availability of portable smartphones and tablets, which have fundamentally transformed technology usage patterns. According to a study by Pew Research Center in the United States, 95% of adolescents have access to a smartphone and 45% say report being online "almost constantly" (Pew Research Center, 2018). In Australia, 99% of those aged 15 to 17 access the Internet, spending an average of 18 hours per week (just over two hours per day) online (Australian Bureau of Statistics, 2016b). Reflecting the ubiquity of technology in young people's lives, evidence suggests technology use may now play an important role in the developmental tasks of identity formation, personal autonomy, and relationships outside the family (Borca, Bina, Keller, Gilbert, & Begotti, 2015).

The accessibility to the Internet has provided the development of interventions that support and extend traditional health services (Rickwood, 2012). There has been an increasing range of targeted mental health and wellbeing websites for young people in Australia, such as ReachOut.com (www.reachout.com) and

BiteBack (www.biteback.org.au), providing tools, forums and information, and eheadspace (www.eheadspace.org.au), a free and confidential online counselling service for young people. In addition, there has been an explosion of free or cheap self-help apps accessible online via app stores, such as iTunes and Google Play, that provide information and interventions from issues ranging from depression to diet and exercise.

Unfortunately, despite the availability and use of technology by young people, there is limited evidence for it improving health outcomes. Most young people (84%) report using the internet to search for health information, however only 34% of those reporting this have subsequently changed their behaviour (Wartella, Rideout, Zupanic, Beaudoin-Ryan, & Lauricella, 2016). In addition, although 21% of young people have downloaded a health-related app, almost half (47%) have either hardly ever or never used them (Wartella et al., 2016). Importantly, a recent meta-analysis of smartphone apps for non-communicable diseases found only limited support for their effectiveness in changing health behaviour (Lunde, Nilsson, Bergland, Kværner, & Bye, 2018), while another meta-analysis found smartphone apps had just a small effect on depressive symptoms in comparison to active control conditions (Firth et al., 2017). In addition, those who need these services are least likely to access help via online counselling, with 62% of young people with a probable serious mental illness reporting they would be uncomfortable seeking information, advice and support from this source (Ivancic, Perrens, Fildes, Perry, & Christensen, 2014). This research suggests that while young people are comfortable accessing online health care, there is also a need for face-to-face services and investigating how technology may be integrated to enhance this face-to-face care.

2.6.5 Participatory design and health technology

Participatory design, or co-design, is the *meaningful collaboration* of researchers or designers *with end-users* in the design of systems, services or products (Muller & Kuhn, 1993). It is a conceptual approach to design and research, that additionally provides practical tools and techniques for involving users. Participatory design

gives end users greater control and engages them closely in the design of technology to ensure it meets their needs and it is contextually relevant (Clemensen, Larsen, Kyng, & Kirkevold, 2007). As shown in Figure 2.3, participatory design in health contexts can overlap with other user-centric research design disciplines and methods, including user-centred design, community development, collaborative inquiry and participatory action research (Hagen et al., 2012). In the last few years *co-design* has largely replaced *participatory design* as the term used to describe this collaborative design process (Sanders & Stappers, 2008), particularly in the health research literature. However, they represent the same concept and in this thesis I have used these terms interchangeably.

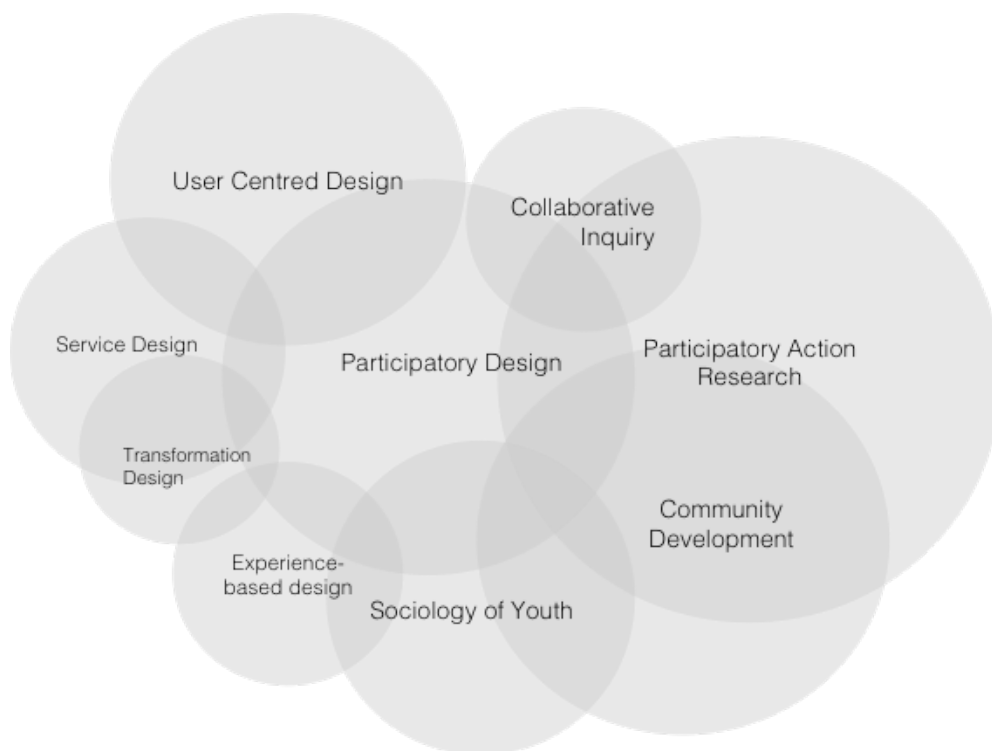


Figure 2.3: Participatory design and its relation to other user-centric research design disciplines and techniques (from Hagen et al. 2012)

In Europe, participatory design had its foundations in technology design with trade unions in Scandinavia in the 1960s and 1970s, when systems designers and

researchers worked together with the people who were to be impacted by change in their workplace (Ehn, 1993). At around the same time in the United States, in industrial and education sectors, there was a shift towards user-centred design where the user's needs were made central to the design of products (Sanders & Stappers, 2008). Initially, user-centred design was driven by 'experts' with users largely passive, consulted through observation or interviews ('user as subject'), and ideas were generated by others. However in time this has evolved to also more closely resemble the European experience of participatory design, with more opportunity for users to participate in ideating and conceptualizing interventions early and throughout the design phases ('user as partner') (Sanders & Stappers, 2008).

Health care is now increasingly integrating the perspective of users, or the unique 'lived experience' of patients, in service and intervention design (Bate & Robert, 2006). This reflects the increased emphasis in health policy and practice on patient-centred care for improved satisfaction and outcomes (Productivity Commission, 2017). Indeed, released in 2014, a key finding of the Australian Government's National Review of Mental Health Programs and Services was that the health system had been driven by service providers rather than the needs of patients. It recommended designing services to be more patient- (or user-) centred, where the focus is on the needs of patients and their families, rather than only on the needs of the provider (National Mental Health Commission, 2014). Following on from this, the National Digital Health Strategy identified the ongoing use of collaborative, co-design and co-production principles as key to the successful implementation of technology in health care (Australian Digital Health Agency, 2017), suggesting a progression in national policy from 'user as subject' to 'user as partner'.

Participatory design has been successfully used to develop a range of health technologies for young people (Blake et al., 2016; Peters et al., 2017; Wadley, Lederman, Gleeson, & Alvarez-Jimenez, 2013). However, a systematic review by Orłowski and colleagues of consumer involvement processes and associated

outcomes for youth mental health or wellbeing technology-based interventions found families, caregivers and implementation-site representatives were under-represented in the co-design of this technology for young people (Orlowski et al., 2015). This suggests that there is a need to ensure that the perspectives of other stakeholders are included when designing and developing health technology for young people.

2.7 Implementation of technology in general practice

2.7.1 What is implementation?

Implementation is the active and planned work undertaken to integrate an innovation within the routine practice of an organisation (Greenhalgh, Robert, Macfarlane, Bate, & Kyriakidou, 2004). In the health care setting implementation often takes the form of translating evidence and clinical guidelines into routine clinical practice. A major challenge with implementation is that it is typically slow and erratic because change is multifaceted and difficult (Gupta, Boland, & Aron, 2017) and, thus, can result in suboptimal care and patient exposure to unnecessary risks (Grol & Grimshaw, 2003). For example, guideline recommendations are followed by general practitioners in an average of 67% of their decisions, however the rate varies greatly depending on the guideline, being significantly lower for otitis externa ('swimmer's ear') (34%) and vaginal discharge (36%) and higher for the diagnosis of heart failure (92%) (Grol, 2001).

Like other organisations, general practice can be understood as a complex adaptive system which consists of a collection of individuals, such as GPs, patients and office staff, who are not always predictable and act in ways that are interdependent (Plsek & Greenhalgh, 2001). Plsek and Wilson argue that the interactions and relationships within a complex adaptive system are more important than the discrete action of individual parts (Plsek & Wilson, 2001). This suggests that when designing and implementing interventions for the general practice setting this complexity needs to be considered to ensure interventions are integrated within existing systems.

There is a growing body of research exploring implementation in the general practice setting. A systematic review of reviews by Lau and colleagues (2015) investigated the effectiveness of strategies for improving implementation of any kind of complex intervention in primary care. They concluded that implementation research had focused on individual-level barriers, such as staff education, and that there was a lack of research on the organisational level and context level strategies that affected implementation (Lau et al., 2015). A subsequent systematic review of reviews published by the same authors investigated the causes of the evidence to practice gap in primary care. They found that factors that impacted implementation were evidence of benefit, ease of use, and adaptability to local circumstances. Based on their findings, they developed a conceptual framework describing four interlinking key levels that influence implementation of change in primary care: intervention (nature and characteristics); professional (attitudes to change, competency); organisational (skill mix, culture, processes, resources); and, external context (policy and legislation, infrastructure) (Lau et al., 2016).

2.7.2 Implementation of technology in health care

The introduction of new technology to administrative and clinical activities is particularly challenging in the health care settings. A meta-review of the literature by Cresswell and Sheikh (2013) found that there are a range of inter-related technical, social and organizational factors that need to be considered to ensure health information technology innovations are useful for both the individual and the organization. The technical features found to facilitate adoption are usefulness, ease of use offering advantages over existing practices, and the ability to operate within existing technical systems. Social factors include general competency of users, personal and peer attitudes, ongoing involvement of key stakeholders at the conception and design stages, and an opportunity for field-testing of early prototypes. Finally, organisational factors include the importance of the support of a lead professional (or 'champion'), proactively allowing more time to incorporate new workflows, and management transparency and acknowledgement of benefits and challenges (Cresswell & Sheikh, 2013). These findings are supported by a

subsequent analysis of 44 systematic reviews of health technology implementation that found the following multi-level factors important for implementation: the individual technology (complexity, cost and adaptability); health professionals (knowledge and beliefs); the process of implementation (planning, engaging champions and evaluating); the inner setting (the fit between the technology and the organisation, leadership engagement and resources); and external policy and incentives (Ross, Stevenson, Lau, & Murray, 2016).

A wide range of theoretical approaches have been developed to explain how and why implementations succeed or fail (Nilsen, 2015). To assist with the appropriate selection and use of relevant approaches in implementation research and practice, Nilsen (2015) has developed a taxonomy that proposes five overlapping categories of theoretical approaches aimed at achieving three overarching aims: describing the process of translating research into practice (process models); understanding and/or explaining what influences implementation outcomes (determinant frameworks, classic theories, implementation theories); and evaluating implementation (evaluation frameworks) (Nilsen, 2015).

Normalization Process Theory (NPT) provides a particularly appropriate theoretical lens to investigate the implementation of a screening technology in the primary care setting and has been widely used in implementation studies (Hooker, Small, Humphreys, Hegarty, & Taft, 2015; Mair et al., 2012; Ricketts, Francischetto, Wallace, Hogan, & McNulty, 2016). Unlike most other theories, NPT accounts for the important social aspects of the implementation of health technology, including the work required to make sense of the technology and its effects on roles and responsibilities (Mair et al., 2012). NPT describes how complex practices and technology innovations become embedded and integrated into health care settings (May & Finch, 2009; Murray et al., 2010). This theory posits that implementation is operationalised in social contexts, including work settings, through four key mechanisms: coherence (how participants make sense of an intervention); cognitive participation (the commitment and engagement of participants; collective action (the work participants do to make the intervention function); and

reflexive action (how participants reflect on appraisal of the intervention after it has been in use). This suggests that the implementation and evaluation of technology in the general practice setting needs to address these domains. In my next chapter, I will discuss how I used NPT as a conceptual framework for my research.

2.7.3 Implementing screening technology in general practice

In studies where clinicians have experienced the use of technology-based screening of young people, they recognise the value of these tools. As explored above, this screening can enhance engagement between young people and health professionals (Bradford & Rickwood, 2012) and disclosure of sensitive health and lifestyle issues (Bradford & Rickwood, 2015). Health care providers have reported that using a technology-based screening tool facilitates identification of and communication about risky behaviours of young people (Darling-Fisher et al., 2014; Goodyear-Smith, Corter, & Suh, 2016), while paediatric primary care providers report these tools improve visit organization and efficiency (Gadomski et al., 2015). However, despite the demonstrated benefits and need, the rate of using digital technology beyond a basic electronic health record in primary care settings is low (McInnes et al., 2006; Schoen et al., 2012). One reason may be that ongoing implementation support has not been provided to fully embed these technologies into routine practice.

Few studies specifically explore the implementation of technology-based screening in general practice settings. One qualitative study of 54 health care providers of adult populations in emergency and general practice settings found that multilevel social and technical factors, such as patient confidentiality and the tool's ease of use, are important for the implementation of a computerized assessment tool (Ahmad, Norman, & O'Campo, 2012). As well as this being an adult population, a key limitation of this study is that the perspective and experience of patients and other practice support staff, such as receptionists responsible for administering the tool, were not explored.

Another study with an adult patient population investigated the barriers and facilitators to the introduction of a psychosocial technology-based screening tool into a cancer centre. It found that the biggest barrier to implementing the technology was the attitudes of front desk staff who were concerned about the additional work it created, lacked communication skills to instruct patients, and did not understand the tool's importance (Clark et al., 2009). Thus, as well as GPs and patients, there is some evidence to suggest receptionist and administrative staff also play important roles in determining successful implementation of technology.

As the interface between the health care system and the community (Neuwelt, Kearns, & Cairns, 2016), receptionists would be expected to be responsible for administering screening tools required to be completed by patients prior to the consultation. General practice receptionists have highly demanding and complex roles (Eisner & Britten, 1999), which includes facilitating patient awareness about new approaches to consultations (Brant et al., 2018). However, receptionists report having minimal involvement in the planning and implementation of new systems that they are expected to deliver (Brant et al., 2018). In particular, despite their central role, there is a paucity of studies that explore the needs and experiences of receptionists in implementing technology-based screening tools.

2.8 Summary and rationale for current research

Adolescence and young adulthood are periods when a wide range of mental health problems and risky health-related behaviours emerge and co-occur, often persisting into adulthood. Despite this, most young people do not seek help for these issues due to a number of major barriers, including embarrassment, stigma, not recognising symptoms as problematic, and a fear of a lack of confidentiality if they do seek help. However, most young people do regularly attend general practice, with evidence suggesting they prefer a patient-centred approach where they are actively engaged in their care. Whilst their attendance at general practice is mostly for physiological ailments, young people's regular attendance suggests that GPs are ideally positioned to deliver health prevention and early intervention

as part of young people's routine health care. Indeed, young people report being willing to discuss these issues with their GP if prompted and doctors agree that identifying mental health and behavioural issues should be part of their role.

Routine opportunistic health and lifestyle screening of young people in general practice is recommended as best practice by peak professional health bodies in Australia and overseas. However, the rates of this screening are low due to a number of key barriers for GPs including a lack of time, an unwillingness to discuss non-presenting sensitive issues, and a lack of training in how to manage a positive result. There is little evidence to guide on frequency of screening or whether it should be opportunistic or completed in a wellness visit. A technology-based screening tool, completed prior to the consultation, is an efficient and systematic solution to address the barriers. Research has shown that technology-based screening tools are acceptable to young people and facilitate disclosure about sensitive topics. They can also provide youth-appropriate recommended advice and referrals to help clinicians manage results (Bradford & Rickwood, 2015).

Despite the potential benefits, this technology is not being utilised in general practice. Evidence suggests that implementation of technology in this complex setting is influenced by a range of inter-related technical, social and organisation factors. However, there is little research specifically investigating how technology-based screening tools should be designed and implemented in a way that ensures that content and functionality support GP and receptionist roles, rather than adding further unwanted administrative burden. There is also a need to explore whether, as well as disclosure, technology-based screening tools affect young people's experience of care and whether they want to have screening integrated into their routine care.

2.9 Research aim and questions

The aim of my research was to address the research gaps identified in this chapter by investigating the design, implementation, and effectiveness of a preventive screening technology intervention for eliciting health and lifestyle risks in young

people attending general practice. This overarching aim was answered through the following four research questions:

1. Does prior research suggest that health and lifestyle screening improves health outcomes for young people presenting to general practice?
2. What are the preferences of young people, general practitioners, practice support staff and parents for the design, use and implementation of a technology-based health and lifestyle screening app for young people in general practice?
3. Does using a health and lifestyle app affects young people's assessment of care and disclosure when attending general practice as part of routine care?
4. Can a health and lifestyle screening app for young people be successfully implemented in a general practice setting?

In the next chapter I describe my research methodology, including conceptual frameworks, and the rationale and design of the three studies that addressed my research questions. I also describe the ethical considerations involved in undertaking my final study and how I addressed them.

3. Methodology

In the previous chapter I explored prior research on young people's health and developmental context, general practice, technology use and its implementation in the complex general practice setting, before outlining my aim and research questions. In this chapter I present the conceptual frameworks that underpinned the research design, and the methods I drew from these frameworks to use in my studies to address the aim and research questions. I end the chapter with a discussion of the key ethical considerations in my research.

3.1 Conceptual frameworks

My research program was underpinned by three conceptual frameworks: the Medical Research Council's Complex Interventions Framework; Co-design; and, the Normalisation Process Theory. Each of these conceptual frameworks supported a different conceptual aspect of my research program, that I will discuss below.

3.1.1 Medical Research Council's Complex Interventions Framework

The Medical Research Council (MRC) is a government agency coordinating and funding medical research in the United Kingdom. The MRC proposes that problems in the evaluation of complex interventions (that is those which include several interacting components or organisational systems), such as the implementation of new interventions in the general practice setting, emerge due to these interventions not being fully defined and developed before being put to trial. To help researchers prevent such problems, the MRC developed a framework outlining a staged and sequential process for the development, evaluation, and implementation of complex interventions to improve health (Campbell et al., 2000). Adopting a linear model based on phases conventionally used in the evaluation of new drugs, the five key stages in the original MRC framework were: 1. preclinical or theoretical phase; 2. observational or modelling phase to identify intervention components and how they interact; 3. exploratory phase to test the feasibility and acceptability of the intervention, ideally using a randomised pilot

trial design; 4. a main randomised controlled trial; and, 5. a long-term implementation phase (Campbell et al., 2000).

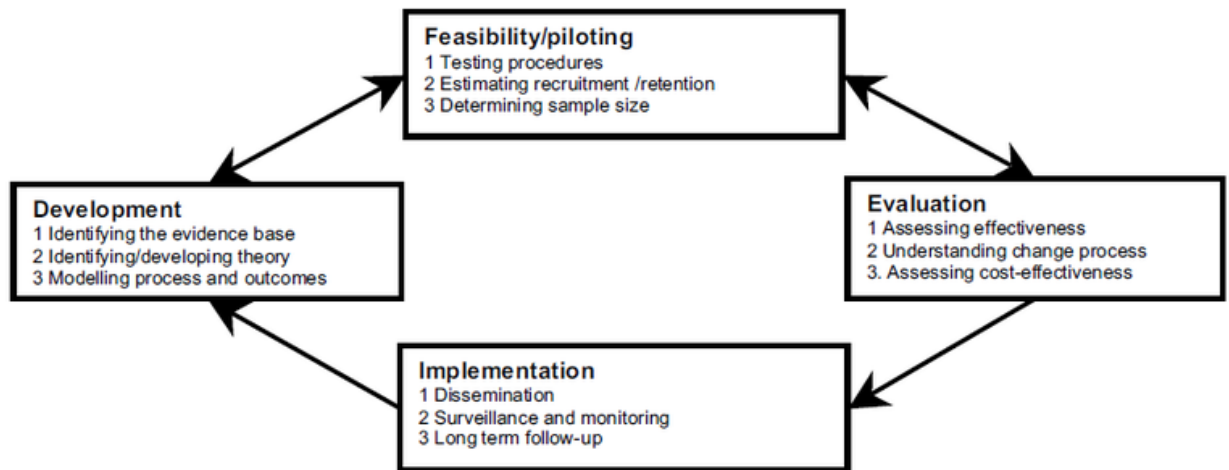


Figure 3.1: Key elements of the development and evaluation process from ‘Developing and evaluating complex interventions: new guidance’ (Craig et al., 2008).

The MRC subsequently updated this framework, recognising that complex interventions may not follow a linear or cyclical sequence and that conventional randomised clinical trials are only one of a range of potential experimental and non-experimental evaluation methods. The key interactive elements in the renewed MRC framework, shown in Figure 3.1, are:

1. Development: where the intervention is developed to the point where it can reasonably be expected to have a worthwhile effect;
2. Feasibility and piloting: where procedures are tested for their acceptability, compliance and retention;
3. Evaluation: where an appropriate evaluation design is selected; and,
4. Implementation: where findings are translated into routine practice or policy and long-term outcomes are monitored (Craig et al., 2008).

This updated framework allows for a more flexible, iterative model of the development-evaluation-implementation process, giving appropriate weight to the development and implementation phases as well as to evaluation (Craig et al., 2008). My research covers the Development, Feasibility/piloting, and Evaluation stages of the MRC framework.

I am looking at the immediate-term implementation of a screening technology intervention as part of the feasibility/piloting phase. Implementation, as it is defined in the MRC framework, is looking at the dissemination and longer-term follow-up of an intervention; this is outside the scope of my research. In addition, in my final study, I used action research to operationalise and understand the change processes according to the evaluation phase of the MRC framework. Action research aims to involve stakeholders in the implementation of change and generation of knowledge in a real-world setting through a cyclical process of collecting, feeding back and reflecting on data (Brydon-Miller, Greenwood, & Maguire, 2003; Hampshire, Blair, Crown, Avery, & Williams, 1999). I discuss this in more detail below when describing the methods of Study 3.

3.1.2 Co-design

As discussed in Chapter 2, co-design, or participatory design, is the *meaningful collaboration* of researchers or designers *with end-users* in the design of systems, services, and products. It is a conceptual approach to design and research, as well as providing practical tools and techniques for involving users productively in design. In co-design, knowledge is generated through experiential, generative activities with an emphasis on co-operative learning and design by doing (Muller & Kuhn, 1993). When co-design is employed, end users have greater control over and engagement in the design of technology, helping to ensure that the final product meets their needs and it is contextually relevant (Clemensen et al., 2007).

Co-design was an approach that underpinned both my co-design workshops (Study 2) and my mixed methods effectiveness-implementation case study (Study 3). Co-design is increasingly used for the design and development of a range of

technology-based health interventions for young people. A key advantage of this collaborative approach over more traditional research is that co-design creates an environment that breaks down inherent power imbalances between researcher and youth participants, allowing young people to fully participate (Peyton & Poole, 2013). Examples of interventions co-designed with young people include an online help-seeking tool (Blake et al., 2016), an online therapy intervention for young people recovering from early psychosis (Wadley et al., 2013), and an asthma self-management app (Peters et al., 2017).

3.1.3 Normalisation Process Theory

I used the Normalization Process Theory (NPT) as a conceptual framework to underpin my research as it has been developed to explain how complex interventions and technology innovations become embedded and integrated into health care settings. NPT posits that implementation is operationalised in social contexts, including work settings, through four key mechanisms:

1. coherence, or how participants make sense of an intervention;
2. cognitive participation, or the commitment and engagement by participants;
3. collective action, or the work participants do to make the intervention function; and,
4. reflexive action, or how participants reflect and appraise the intervention after it has been in use (May & Finch, 2009; Murray et al., 2010).

There are three compelling reasons that support NPT being a particularly appropriate theoretical lens to investigate the implementation of technology in the primary care setting. Firstly, NPT is identified as an implementation theory that provides a causal explanation of aspects of implementation, as well as having been used widely as an evaluation framework (Nilsen, 2015). Secondly, NPT was specifically designed for the implementation of health technology and accounts for the important social aspects of its implementation which were previously neglected in the published literature (Mair et al., 2012). Thirdly, NPT has been

widely and successfully used as an evaluation framework in the implementation of screening tools in the primary health setting, including in chlamydia screening (Ricketts et al., 2016), electronic cancer risk assessment (Chiang, Glance, Walker, Walter, & Emery, 2015), and family violence screening (Hooker et al., 2015).

3.2 Research design

I used a mixed methods multiphase design for my research. Mixed methods research involves the collection and analysis of both qualitative and quantitative data, linking or integrating the two forms of data in a single study or series of studies (Creswell & Plano Clark, 2011). Mixed methods is appropriate for research investigating the systematic complexities of design and implementation in general practice settings, as it provides multiple perspectives and insights beyond the scope of a single method (Borkan, 2004; Creswell et al., 2004; Scammon et al., 2013).

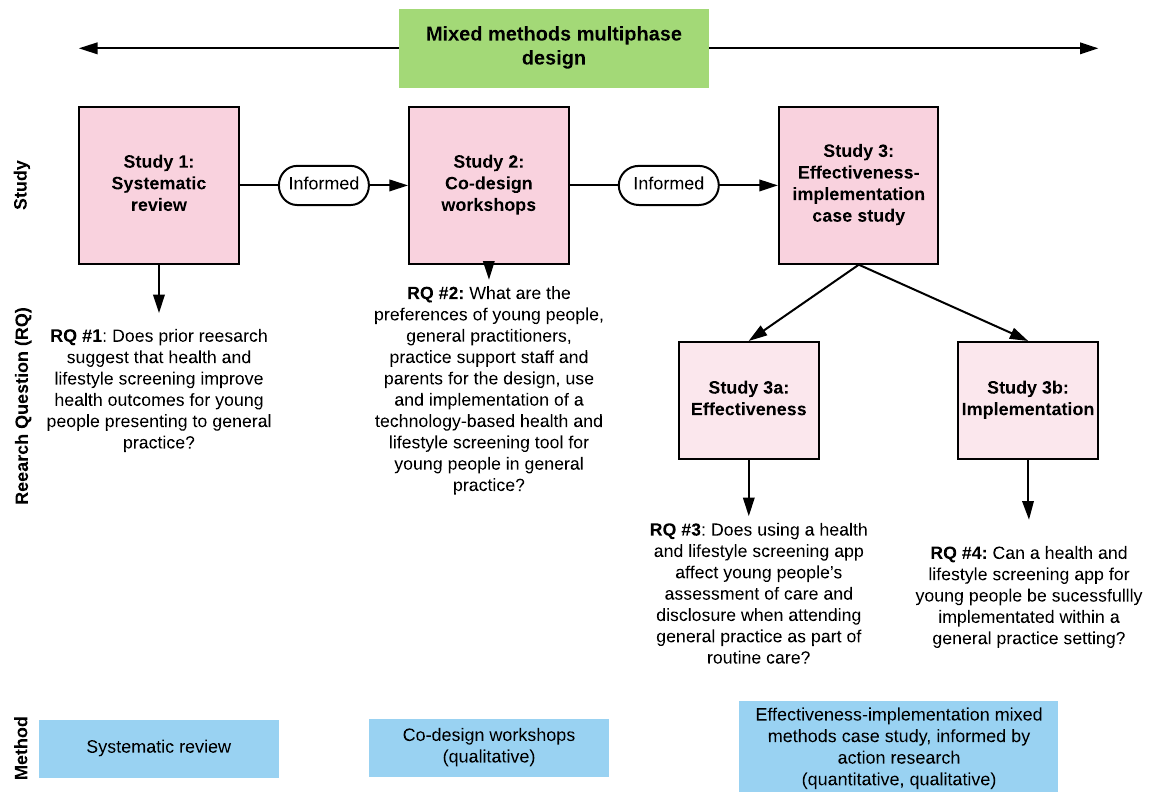
The multiphase design is one of six major mixed methods research designs proposed by Creswell and Plano Clark (2011). Multiphase design combines both sequential and concurrent research to examine a problem or topic through an iteration of connected quantitative and qualitative studies, with each new study building on what was learned previously to address a central program objective (Creswell & Plano Clark, 2011). The strengths of a multiphase mixed methods design are that it has the flexibility required to address a set of interconnected research questions, and that results can be published from individual studies while still contributing to an overall evaluation or research program. These strengths are maximised in my research design, described in more detail below, where each study informed the next and the results of each individual study were published in peer-reviewed journals.

Conversely, the challenges of multiphase mixed method design are that sufficient resources and time are required to implement several phases, that new or modified ethics applications may be needed for each phase, and that there is a need to anticipate challenges associated with individual concurrent and sequential

approaches within individual or subsequent phases (Creswell & Plano Clark, 2011). I addressed these challenges in my research by ensuring I had adequate resources, such as employing two research assistants to assist in data collection, by submitting separate study ethics applications in a timely manner, and by allocating time with my supervisors to discuss and address unexpected issues.

My research design is illustrated in Figure 3.2, consisting of three studies, each addressing a separate question. The first study was a systematic review of the literature which provided an understanding of the need for and a rationale for developing a technology-based health and lifestyle screening tool. The second study was a series of co-design workshops conducted to identify and explore user and stakeholder design and implementation requirements of a technology-based screening tool. The final study was a mixed methods effectiveness-implementation case study that used a methodology informed by action research to investigate both young people's experience of care when using the app as part of their routine care, and the implementation of the app in a general practice setting. The methodology of each study is described in more detail in the next sections.

Figure 3.2: Research design



3.2.1 Youth participants

Earlier, in my literature review (Chapter 2), I defined young people as those aged 10 to 24 years, as recommended by Sawyer and colleagues (Sawyer et al., 2012) in their review of the literature. However, the young people who participated in my studies were aged 14 to 25 years. I raised the lower age limit to 14 years because of ethical considerations involving the inclusion of minors in health research (discussed in further detail below) and the fact that young people aged 14 to 17 would be able to be assessed as mature minors. In addition, I extended the upper age limit for youth participants to 25 years, to reflect of the definition used by major youth-focused Australian government-funded bodies and non-government health organisations including the Young and Well Cooperative Research Centre (who provided my PhD scholarship), headspace (www.headspace.org.au), ReachOut.com (www.reachout.com), and YacVIC (www.yacvic.org.au), a leading advocacy organisation for young people in the state of Victoria.

3.3 Study 1 – Systematic review methodology

3.3.1 Overview

The research question of Study 1 was: Does prior research suggest that health and lifestyle screening improves health outcomes for young people presenting to general practice? To answer this question, I conducted a systematic review of the literature which identified: the characteristics of screening tools that have been studied, including the domains covered and the format of administration; the study characteristics, including the clinic setting and age of participants; whether screening was accompanied by an intervention; and, whether any changes in health outcomes were found.

While not within the scope of my research, it was important that terms for intervention to be included in my systematic review. Screening typically does not occur in isolation and, as recommended by national guidelines, should be followed up with appropriate interventions such as motivational interviewing (Rubak, Sandbaek, Lauritzen, & Christensen, 2005) referrals to specialty care (Husky et al., 2010) or the provision of health education materials (Klein et al., 2001). Indeed, in the United States, the Screening, Brief Intervention and Referral to Treatment (SBIRT) model is recommended by the Substance Abuse and Mental Health Services Administration as an effective universal screening and intervention guide for young people's problematic drug and alcohol use in primary care settings (McCance-Katz & Satterfield, 2012). There is also evidence to suggest that interventions for specific detected health issues in young people can improve depression symptoms (Williams, O'Connor, Eder, & Whitlock, 2009), decrease weight in the obese (US Preventive Services Task Force, 2010) and reduce sexually transmitted infections (Lin, Whitlock, Connor, & Bauer, 2008).

3.3.2 Rationale

A systematic review aims to systematically identify, critically appraise and synthesise all primary evidence that matches pre-specified eligibility criteria in order to answer a specific research question (Green et al., 2008). Compared to

narrative reviews, systematic reviews have a number of important advantages in that they: search comprehensive sources; have an explicit search strategy; have selection criteria which are uniformly applied; include a rigorous critical appraisal; and are evidence-based (Cook, Mulrow, & Haynes, 1997). As such, systematic reviews assess whether findings from multiple studies are consistent and can be generalised across populations and settings (Mulrow, 1994). A systematic review was particularly appropriate for my research given that as part of their framework for developing and evaluating complex interventions (discussed above), the MRC recommend conducting a systematic review as an ideal way to identify relevant and existing evidence and to assess the potential effectiveness and implementation of a planned complex intervention (Craig et al., 2008).

3.3.3 Search strategy

My search strategy was in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) guidelines (Moher, Liberati, Tetzlaff, & Altman, 2009). These guidelines are an evidence-based minimum set of items for reporting systematic reviews. The systematic review was registered on the PROSPERO website (<http://www.crd.york.ac.uk/prospero>, registration number CRD42013005828). By providing a comprehensive list of systematic reviews registered at their commencement the PROSPERO database aims to help avoid duplication and reduce reporting bias.

On 18 November 2015 I conducted a search on Medline, PsycINFO, Scopus and the Cochrane Library databases using search terms representing four thematic concepts: primary care, young people, screening, and mental health and health-compromising behaviour (see Appendix A for terms used in each database). The reference lists of all relevant studies and reviews were also manually searched.

Individual health outcome measures were not specified in the inclusion criteria. An exhaustive search of the databases had previously been undertaken that listed individual health-compromising behaviours and mental health disorders in the search terms. However, this was found to be impractical as most papers returned

were about screening for individual health conditions rather than for multiple domains. Instead broader terms were tested (e.g. 'mental disorders' rather than 'depression', 'anxiety', 'schizophrenia' etc.) and papers more relevant to the objectives were found. In addition, the original intention, as stated in our Prospero Registration Form, was to exclude young people with pre-existing health conditions. However, a preliminary look at the literature returned such a small number of results that it was felt it would be reasonable to remove this exclusion criterion and in doing so acknowledge the differences in these participants in the results and discussion, including the potential limitations to generalizability.

To be eligible for inclusion, studies had to: include a measure of health outcome; include at least 75% of participants aged 25 years and under; use a screening tool or approach that assessed more than one health domain, which may have included at least one measure of behaviour modification, such as drink driving; and be conducted in a primary care setting. As suggested by Linde et al. (2002), this review included uncontrolled trials and qualitative studies to obtain an overview of the topic and inform future research. Studies were excluded if they did not evaluate health outcomes.

3.3.4 Quality and risk of bias assessment

A central objective of a systematic review is to critically and systematically appraise the quality and the risk of bias of studies found in the search. Bias occurs in research when systematic errors or flaws in the design, conduct, analysis, and reporting of research leads to the under- or over-estimation of an intervention effect (Wood et al., 2008). There are a range of available tools for assessing the quality and risk of bias in studies for different types of study designs, including randomised controlled trials, cohort and case-control studies and cross-sectional studies (Zeng et al., 2015). For my systematic review, I assessed the quality and risk of bias of each study using the Quality Rating Scale (QRS) (Moncrieff, Churchill, Drummond, & McGuire, 2006). A key advantage of the QRS over other rating scales is that it is suitable for the appraisal of both randomized and non-randomized trials.

The QRS is a 23-item instrument for assessing the quality of clinical trials, covering both internal validity (control of bias) and external validity (generalisability). Each item of the QRS is rated 0 to 2 with a total instrument range of 0 to 46; higher scores indicating better quality. Both I and one of my supervisors, Dr Sylvia Kauer, used the QRS independently to rate all selected papers. Since one of the potential limitations of the QRS is that it may have only moderate inter-rater agreement (Moncrieff et al., 2006), inter-rater reliability was assessed by Cohen's absolute weighted kappa statistic in Stata Version 12.0. Weighted kappa allows for different levels of agreement in ordered data, and the absolute function allows for all numbers including those unassigned by either rater.

The studies were also compared to determine whether there were similarities in the country of research, research group, or years in which the research was conducted. All studies were included irrespective of their design, quality, and biases. No statistical analyses were conducted due to the heterogeneity of study designs permitted in the inclusion criteria. Instead, I favoured narrative description of the data including statistical analyses where appropriate.

3.4 Study 2 – Co-design workshops - methodology

3.4.1 Overview

The research question of Study 2 was: What are the preferences of young people, general practitioners, practice support staff and parents for the design, use, and implementation of a technology-based health and lifestyle screening tool for young people in general practice? To answer this question, I first conducted a series of co-design workshops with representative users and stakeholders: young people, GPs, and parents of young people. In addition to these workshops, I conducted one-on-one face-to-face semi-structured interviews with general practice staff (receptionists and practice managers). The workshops and interviews were iterative in nature, in that each workshop or interview incorporated and extended findings from earlier ones.

3.4.2 Rationale

There is increasing recognition from health researchers of the potential of co-design methods to identify and explore the acceptance and adoption requirements of health technologies (Poole, 2013). Co-design has the advantage over other research methods of providing inclusive and meaningful participation for participants in the research process in a way that other traditional methods of research do not. This is particularly important in the design of health services which have previously been driven by service providers rather than the needs of patients and families (National Mental Health Commission, 2014). In particular, co-design is recommended as an appropriate and valuable approach to designing health interventions with young people (Hagen et al., 2012). In addition, it was important to include reception staff, given that there was little research exploring their needs in the design and implementation of a screening technology intervention.

3.4.3 Participants

Participants in Study 2 were recruited via a range of sources. Young people were recruited through an advertisement on Facebook targeting those aged 14 to 25 living in the Melbourne metropolitan region. GPs and practice staff were recruited through an advertisement in the newsletter of the Victorian Primary Care Practice-Based Research Network, managed by the Department of General Practice at the University of Melbourne. Parents of young people aged 14 to 25 were recruited through an advertisement in the weekly staff newsletter of the University of Melbourne. These parents were not the parents of the young people in our study, as this could have compromised those young people's sense of confidentiality and willingness to be open about their experience of going to the GP. See Appendix C for recruitment ads.

3.4.4 Procedure

Ethics approval for Study 2 was obtained from the University of Melbourne's Health Sciences Human Ethics Sub-Committee (ID 1443228) (see Appendix B).

3.4.4.1 *Young people workshops*

For the young people workshop I sought to find out where and when young people would like to use the technology-based screening tool, on what device, as well as functional and content requirements. I held two workshops with young people, one with those aged 14 to 17 and another with those aged 18 to 25, for two key reasons. Firstly, as outlined above in the literature review, those aged under 18 are generally at a different developmental stage than young adults aged over 18 and I thought it important to explore whether these two groups would have distinct design requirements. Secondly, it provided a chance to iterate findings across workshops from the first to second group and to further explore key design requirements. Each of these workshops was approximately four hours in length and each participant received a AUD\$60 gift voucher.

The first activity in each young people workshop was developing personas, in order to understand the range of motivations and needs of young people in using a technology-based health and lifestyle screening tool. Personas are fictional characters used in technology design to represent the typical user of an intervention. Key sections of the persona templates had been partially filled out prior to the workshop. These included age and location, reason for seeing a GP, underlying health concern (different to the presenting condition), and a rating of their self-awareness. This information was based on adolescent health trends (Sawyer et al., 2012). Young people then completed critical design information such as screening location and device. Providing a partially-filled, rather than blank, persona template is unorthodox; however, it enabled sensitive health issues, such as sexually transmitted infections, to be identified in a non-confronting way, while still ensuring there was opportunity to feedback and own the process.

Using the personas they had developed, participants then created storyboards describing how people represented by the personas would like to use the tool in the real-world setting, thus providing insights into adoption barriers and facilitators. Next, young people created paper-based prototypes to identify design,

content and functionality requirements. A final activity completed by only the 14 to 17-year-old group was creating and acting out a role-play scenario in which they imagined recommending the app to a friend. This helped to identify the potential benefits of using a technology-based screening tool as perceived by young people.

During the first workshop the 14 to 17-year-old participants stressed that the language in which the app questions was expressed would be an important determiner of acceptability. Thus I asked the 18 to 25-year-old group to review and rewrite the app questions, which were taken from the HEEADDDS screening framework for interviewing adolescents about a screening framework for the assessment of young people's health and lifestyle. The framework covers the following domains: Home environment, Education and employment, Eating, peer-related Activities, Drugs, Sexuality, Suicide/depression, and Safety from injury and violence (Klein et al., 2014).

3.4.4.2 GPs

After the workshops with young people, I, along with one of my supervisors, also a practicing GP, facilitated a workshop with a group of 8 GPs. The aims of this workshop were to identify the requirements for the summary report of the app and how GPs would require it to be integrated into their existing technology use. The workshop activities were paper-based prototyping and systems mapping. Systems mapping is an activity in which participants create a visual map of the different actors, links, and flows of information that would interact with the screening app. The workshop was approximately 3 hours in duration and the GPs received a AUD\$250 gift voucher for their participation.

3.4.4.3 Practice staff

Following the workshop with GPs I conducted a series of semi-structured interviews with 11 female practice support staff (receptionists and practice managers). Semi-structured interviews allow set topics to be explored in depth,

while also allowing new issues to arise and be explored (Kelly, 2010). I interviewed participants in a private room at their place of work and they each received a \$30 gift voucher. The aim of these interviews was to explore the current technology use of practice staff and their needs in terms of how a health and lifestyle screening app could be designed to ensure adoption within their workflow. The interview schedule for practice staff was as follows:

- 1 Can you tell me how you use your clinic software? What client information do you see and check when you make the booking?
- 2 Does your booking software have the ability for you to create an alert system (i.e. to set reminders for self or doctors)? (i.e. can you create a reminder for young people)
- 3 Do you use the software to communicate with the GP – e.g. let them know clients have arrived?
- 4 Do you currently use technology to communicate with patients – e.g. SMS reminders, emails with information?
- 5 When and how do your patients currently fill out any pre-consultation questionnaires? Are these technology- or paper-based?
- 6 How are you involved in the administration of test results (e.g. sending them to GPs or patient, checking they have been received/urgency etc.)?
- 7 What is the biggest challenge for you in your day-to-day work? What things are the biggest facilitators?
- 8 In an ideal world, how would you administrate a screening app (location, device) for young people in your practice?
 - 8.1 What do you think are the barriers to implementing a pre-consultation screening app in your practice for young people (pre-consultation – home and/or waiting room)
 - 8.2 What would be the facilitators to implementing screening apps in your practice for young people?
- 9 What functionality/design would you need to make a screening app workable for you in your clinic?
- 10 Do you have any other comments or suggestions?

3.4.4.4 *Parents*

The final workshop was held with parents of young people aged 14 to 25. This was approximately two hours in length. I did not mirror the workshops with young people by holding separate workshops for parents of those with children aged 14 to 17 and another for those aged 18 to 25, as I felt it likely that some participants would have children in both age groups and might offer useful perspectives. The purpose of this workshop was to explore how parents would feel about their child using a health screening app that facilitated young people to talk about sensitive issues without their parent present, and to identify any design features that would facilitate their acceptance of it. The two activities were a brainstorming session to identify concerns and needs, and a role-play activity, where parents acted out a phone interaction between a parent and receptionist that would facilitate app acceptance by parents. Each participant received an AUD\$60 gift voucher.

3.4.5 *Analysis*

Materials collected at the workshops were: audio recordings, paper materials (group discussion notes, prototypes, storyboards), and photos of whiteboard notes. The interviews I conducted with practice staff were also recorded. I transcribed all audio recordings and conducted a thematic analysis of all materials to identify patterns or themes within the data (Braun and Clarke 2006). An inductive approach was taken, where themes emerge directly from the data, rather than being informed from a priori theory. An advantage of inductive analysis is that themes identified are strongly linked to the data, rather than informed by a potentially limiting theoretical lens (Braun and Clarke 2006). Themes were discussed and agreed upon with my supervisors who had also attended the workshops.

3.5 Study 3 – Effectiveness-implementation study - methodology

3.5.1 Overview

Study 3 sought to answer my final two research questions: 1. Does using a health and lifestyle app affect young people's assessment of care and disclosure when attending general practice as part of routine care?; and, 2. Can a health and lifestyle screening app for young people be successfully implemented in a general practice setting? To answer these dual research questions, I used an effectiveness-implementation hybrid design to conduct a mixed-methods case study.

3.5.2 Rationale

Effectiveness-implementation hybrid designs combine elements of both effectiveness and implementation research in health care and aim to facilitate a more rapid translation of evidence-to-practice of interventions (Curran, Bauer, Mittman, Pyne, & Stetler, 2012). A faster translation is particularly important for investigating the effectiveness and feasibility of technology, where the constant and rapid development and release of new technologies mean that traditional lengthy research trials are problematic; trials are so tightly controlled that they do not reflect the complexity of real-world clinical settings, and the slow pace of trials results in evaluated technologies that are outdated by the time they are validated (Mohr, Weingardt, Reddy, & Schueller, 2017). Curran et al. (2012) propose three main types of hybrid design: Type 1 focus on assessing effectiveness while gathering information on implementation; Type 2 have a dual focus of assessing both effectiveness and implementation; and, Type 3 focus on assessing implementation while gathering information on effectiveness (Curran et al., 2012). Hybrid designs have previously been successfully used to investigate the effectiveness and implementation of a range of interventions in the primary care setting, including brief cognitive behavioural therapy (Cully et al., 2012), a diabetes self-management support program (van Dijk-de Vries et al., 2015), and a family history collection tool (Wu et al., 2013). For my third and final study, I used the

Type 2 hybrid design where both effectiveness and implementation components are co-primary aims, and is recommended for use where there is a strong base of direct or indirect evidence to support both clinical and implementation interventions. My study had this strong base in that, as outlined in Chapter 2, previous research has shown that both young people and GPs find technology-based screening acceptable and that it increases disclosure of sensitive issues (Brown & Wissow, 2009; Fothergill et al., 2013), while a systematic review of the literature found that the implementation of technology in complex health care setting is influenced by a range inter-related technical, social and organisation factors (Cresswell & Sheikh, 2013).

For the effectiveness component of Study 3, I compared a one-month pre-intervention, Treatment-As-Usual (TAU) phase with a two-month intervention phase. In the intervention phase the app was integrated into the routine care of young people attending a general practice. The implementation component of the effective-implementation study in Study 3 was an in-depth implementation case study. Case study research is defined by Yin (2009) as “an empirical inquiry that investigates a contemporary phenomenon in depth and within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident” (p.18) (Yin, 2014). One advantage of case studies is that they are suitable for investigating how new technology interacts within complex organisational settings, identified by how contextual factors affect implementation and patient care (Darke, Shanks, & Broadbent, 1998; Greenhalgh et al., 2008). Another advantage of case study research is that it usually incorporates multiple sources of data, which facilitates triangulation. Triangulation occurs when two or more distinct methods of data collection of the same phenomena are used in order to check the validity of findings (Denzin, 1989; Jick, 1979). Thus, in my final study, as described below and in detail in Chapter 5, I assessed young people’s ratings of patient-centred care and youth-friendly care via both exit surveys and semi-structured interviews, while, also described below and in detail in Chapter 6, I assessed implementation through staff interviews and through the analysis of support provided to staff, and key implementation measures from young people.

In contrast to these advantages, a key criticism of the case study method is that they have limited external validity, which can mean that findings are not generalizable to other settings or populations. While I acknowledge this as a limitation of the study, and that findings need to be replicated in larger studies, the participants of the co-design workshops and reference groups were from a diverse range of backgrounds. In addition, the in-depth case study provides a foundation for research in a previously unexplored area of screening app use and implementation for young people attending primary care.

3.5.3 Intervention site

To be eligible to participate in the study, the practice needed to be located in Victoria, already use the SMS feature of their clinical software to communicate with their patients (in order to send a link to the screening app), service predominantly English-speaking patients, see a minimum of at least 40 young people aged 14 to 25 per week, and be able to demonstrate the willingness of at least a two GPs as well as all practice staff to participate.

Recruitment of the practice was conducted through the Victorian Primary Care Practice-Based Research Network, managed by the Department of General Practice at the University of Melbourne (see Appendix E for recruitment advertisement). I emailed Network members the Plain Language Statement describing the purpose and requirements of involvement in the study. A total of eight practices expressed an interest in participating, of which six were ineligible: three not seeing a minimum of 40 young people per week, two not using SMS, and one servicing a predominantly refugee population with limited English. Of the two remaining practices that met the eligibility criteria, one was located in a regional city of Victoria and one in a suburb of Melbourne. I considered recruiting both practices to the study. A key advantage of having two participating clinics would have been in being able to compare and contrast the experiences of participants using the app in an urban setting to those in a regional setting. However, the intense time and resource requirement of case study design made concurrent data collection at both practices impractical, as I needed to be physically present in the practice every day

of the study for data collection, field observations and to liaise regularly with staff to facilitate the implementation process. Nor was collecting data sequentially in one practice and then in the other a possibility, given the limited time of the PhD candidature. Thus, I decided to conduct the study at one practice and, of the two practices, the urban one was chosen as it was the most convenient and a more representative sample of the broader (Victorian) population.

I have described the context of the case study in detail in the Methods section in Chapter 8, by adapting Bronfenbrenner's representation of the layers of influence on an individual's development over time to the layers of influence potentially affecting the uptake of a new intervention in general practice over time at a macro, meso, and micro level (1977). This framework is appropriate to use in my study, having been used elsewhere to understand technology and innovation adoption and implementation in health care (Gagnon et al., 2008; Kyratsis, Ahmad, & Holmes, 2012). In summary, at the macro level the clinic selected to participate is a large GP-owned and operated practice located in an area of relative socio-economic advantage in urban Melbourne, Australia. At the meso level, the clinic is open 365 days a year and staffed by 12 GPs, a practice manager, a reception coordinator, and eight receptionists. The practice is funded by a patient co-payment on top of the national free universal health insurance. They see patients across the life span, with between 46 and 100 young people aged 14 to 25 years attending the clinic each week. At the micro level, although the clinic has electronic patient files and an appointment system, new patient information is collected via paper forms and then transcribed by receptionists into their software. The GPs are used to checking clinical information, such as pathology results, before seeing their patients, though they do not typically navigate away from their clinical software to other websites during consultations.

3.5.4 Participants

3.5.4.1 *GPs and support staff*

The four GP principal owners and all support staff of a primary care clinic located in urban Melbourne, Australia, participated in the study. All four participating GPs were male, with three aged 45-54 years and one aged 55-64 years. The support staff consisted of a practice manager, a reception co-ordinator, and eight receptionists, with all except three receptionists participating in the final interview. The practice support staff would be responsible for administering pre-consultation screening to young people. Of the practice staff interviewed, all seven were female and varied in age, with two aged 25-34 years, one aged 35-44 years, two aged 45-54 years, and two aged 55-64 years.

3.5.4.2 *Young people participants*

Young patients aged 14 to 25 of participating GPs, attending for routine primary care during the study period, were invited to participate in the study.

3.5.5 Intervention

Based on the design needs identified in the co-design workshops held with young people, GPs, practice support staff (PSS), and parents in Study 2, I contracted a commercial software developer to build the health and lifestyle screening app, “Check Up GP”. To continue the co-design process, I recruited two reference groups representing the main end-users of the app; one of young people aged 14-25 and another of GPs. These reference groups provided feedback and guidance on the design, content, and implementation of Check Up GP to ensure the final product reflected the requirements identified in the original co-design workshops. It was also in consultation with youth reference group that “Check Up GP” was agreed upon as a suitable name for the app. The co-design process was also directly guided by patient-centred care (Little et al., 2001b) and youth-friendly care (Ambresin et al., 2013). For example, tips for communicating with young people were included for GPs, reflecting the guideline-care component of youth-friendly

care. Table 1 within the published article in Chapter 5 shows the key technology and design features of Check Up GP for both GPs and young people that are mapped onto each component of patient-centred care and youth-friendly care.

Check Up GP presented two main interfaces: the questionnaire that patients answered; and the summary report for GPs. The questionnaire was adapted from the HEEADSSS preventive health framework for interviewing adolescents (Goldenring & Rosen, 2004; Klein et al., 2014) recommended by the Royal Australian College of General Practitioners (Royal Australian College of General Practitioners, 2012). The framework covers the range of health, social, psychological and physiological issues and behaviours contributing to the major burdens of disease for young people and suggests that they be raised and explored with young patients: Home environment, Education and employment, Eating, peer-related Activities, Drugs, Sex and sexuality, Suicide/depression, and Safety from injury and violence (Goldenring & Rosen, 2004; D. Klein et al., 2014). I included validated screening tools in many of the HEEADSSS domains: eating disorders (SCOFF) (Morgan, Reid, & Lacey, 1999); anxiety (GAD-2) (Kroenke, Spitzer, Williams, Monahan, & Lowe, 2007); depression (PHQ-2) (Kroenke, Spitzer, & Williams, 2003); and, drugs and alcohol (CRAFFT) (Knight et al., 2002). At the beginning of the screening process I included information about the research study and the purpose of the app, supplemented by a short video. This video showed young people being asked by receptionists, either on the phone or in the waiting room, to complete Check Up GP before their appointment, and how the responses would be discussed during their consultation. Patient responses to the questions in the format of a clinician summary report were immediately made available to the GP via a secure website. The summary highlighted areas of concern as well as strengths, along with tips on youth-friendly consultations, suggested actions to take on areas of concern including referral options. (See Appendix G for screening questions, suggested actions and referral options used in Check Up GP.)

3.5.6 Procedure and measures

The effectiveness and implementation components of Study 3 were conducted concurrently over a three-month period, with one month for collection of TAU baseline data and two months for implementation of Check Up GP. The length of the study was reached by agreement with the clinic prior to the commencement of the study.

3.5.6.1 Study 3b: Effectiveness study

The effectiveness study had three main phases. The first phase was a Treatment-As-Usual (TAU) phase which consisted of a GP profile survey, conducted at the start of data collection on GPs self-perceived ratings of consulting and communicating with young people, and 'exit surveys' for young people, conducted at the practice of young people post-consultation with their GP. The second phase was an intervention phase, that involved exit surveys of young people post-consultation after Check Up GP had been implemented. The final phase was a post-intervention phase employing semi-structured interviews with young people. The measures and procedure for each phase are described below and summarized in Table 3.1.

Table 3.1. Measures used in the treatment-as-usual (TAU), intervention and post-intervention phase.

Name of measure	Type, source ,and content of measure	Method and phase of administration
GP measures		
GP profile survey	Demographic information survey Age, gender, previous training in youth health.	Paper questionnaire, TAU

Knowledge and confidence	Self-rated Likert scales (from 1-not at all to 7-extremely) (Sanci et al., 2012) How knowledgeable and confident in: consulting with young people aged 14-17; consulting with young people aged 18-25; consulting with male young people; consulting with female young people; communicating with young people; and exploring issues beyond the presenting problem.	Paper questionnaire, TAU
Enthusiasm	Self-rated Likert scale (from 1–very unenthusiastic to 11-very enthusiastic) (Sanci et al., 2012) Self-rated Likert scale (from 1–very unenthusiastic to 10-very enthusiastic) (Sanci et al., 2012) Enthusiasm for seeing young people	Paper questionnaire, TAU
Young people’s measures (completed post consultation)		
Disclosure	Self-rated Likert scales (from 1–no disclosure to 5-full disclosure, or not applicable) adapted from Bradford and Rickwood (Bradford & Rickwood, 2015) Disclosure about: home life; school/work; bullying/harassment; alcohol and drug use; sexual health, sexuality; safety; mood; addiction; stressful events; diet; exercise; sleep patterns; and, risky behaviour.	Tablet questionnaire, TAU and intervention
Patient-centred care	Self-rated Likert scales (from 1-very strongly agree to 7-very strongly disagree), validated tool by Little et al. (Little et al., 2001a) A 21-item validated tool consisting of 5 components of patient-centred care: communication and partnership;	Tablet questionnaire, TAU and intervention

	personal relationship; health promotion; positive approach to diagnosis and prognosis; and interest in the effect on patient's life.	
Youth-friendly care	Self-rated Likert scales, selected items from tool by Haller et al. (Haller et al., 2012)^b Trust in the GP (from 1-poor to 5-excellent); whether expectations were met (from 1-strongly disagree to 4-strongly agree); whether there was enough time to ask questions (from 1-strongly disagree to 4-strongly agree); and, level of comfort with GP (from 1-not at all to 5-very comfortable).	Tablet questionnaire, TAU and intervention
Fear of judgment	Self-rated Likert scales (from 1-not at all concerned to 5-very concerned) adapted from Bradford and Rickwood (Bradford & Rickwood, 2015)^c How worried young people were that: the GP would think they were a bad person if they talked about everything they had been thinking, feeling and doing; the GP would think there was something really wrong with them; they would learn things about themselves they didn't want to know; they would lose control of their emotions; and, that the GP would judge them.	Tablet questionnaire, TAU and intervention
App acceptability	Self-rated Likert scales (from 1-not at all to 5-very much) from Bradford and Rickwood (Bradford & Rickwood, 2015) Confidence of Check Up GP providing an accurate picture; comfort in disclosing personal information through Check Up GP; whether questions were difficult to understand; whether questions caused upset, and,	Tablet questionnaire, intervention

	whether the GP addressed issues raised.	
App usability	Self-rated Likert scales, selected items from validated tool by Stoyanov et al. (2015) (Stoyanov et al., 2015) How easy Check Up GP was to learn (from 1-very hard to 5-able to use immediately) and aesthetic quality (from 1-no visual appeal to 5-very attractive).	Tablet questionnaire, intervention
Overall opinion and willingness to use again	Self-rated categorical responses Opinion of using Check Up GP (good idea, bad idea, don't know), whether willing to use again (yes, no, and, if so, how often).	Tablet questionnaire, intervention
Youth interview	Semi-structured interview Experience of using Check Up GP, how it was administrated and integrated into routine care, and if they would like to use the app again in the future.	Phone interview, audio-taped, post-intervention

a: adaption was replacing 'therapist' with 'doctor' and 'I lied or misrepresented myself' with a 'not applicable' option

b: English version of tool validated in Bosnian language

c: adaption was replacing 'therapist' with 'doctor'

Phase 1: Treatment-as-usual

GPs completed a brief paper-based profile survey of demographic information and self-rated their enthusiasm, knowledge and confidence in consulting and communicating with youth. I then collected exit interviews from young people attending the clinic. During this phase, I or one of two research assistants approached young patients in the waiting room when they arrived, and if they were seeing a participating GP and aged 14-25, the researcher provided them with information about the study and invited them to participate. If they agreed to participate, the young patient was asked to take a form (Appendix F) into their

consultation for their GP to assess their eligibility, including if those aged under 18 were sufficiently mature to participate (i.e. if they were a 'mature-minor'). The patient handed the form back to the researcher upon returning to the waiting room. After their consultation, each participant completed the short exit survey on a tablet in the waiting room, with consent provided at the start of the survey. As described in Table 3.1, this survey asked young people to self-rate levels of disclosure, and to rate patient-centred and youth-friendly care and perceived fear of judgement from their GP.

Phase 2: Intervention

Following the treatment-as-usual phase, clinic staff were introduced to the Check Up GP app. GPs and PSS were trained in administering and using Check Up GP. This included showing a short video which demonstrated how to administer and integrate the app into the consultation with young people. I then met individually with each GP to ensure that they could easily access the online clinician summary on their computer and felt comfortable using it. At this time, two training points were stressed: first, the importance of acknowledging all issues raised, and if time was not available to address them, to then organise a follow up consultation; secondly, to ask for time alone when discussing personal or sensitive issues if a parent was attending with the young person. These practice points were also available to GPs in the clinician interface of the app. I worked closely with GPs and PSS throughout the intervention phase to refine the app and its administration in rapid cycles of continuous quality improvement (Langley, Nolan, Nolan, & Norman, 1996).

Receptionists informed young people or parents about Check Up GP when they phoned the clinic to make an appointment. Receptionists then flagged the appointment in the clinical software so the reception co-ordinator would send the patient an SMS containing the app link. Patients could choose to complete Check Up GP before they arrived at the clinic or in the waiting room just prior to their appointment. When young patients arrived at the clinic, receptionists asked those aged 14-25 years, who were patients of participating GPs, if they had received the

SMS and completed the app. Patients who had not completed the app were handed a tablet to complete it in the waiting room before their consultation. The receptionist made a note in the clinical software reminding the GP to review the young person's responses prior to calling them into the consultation.

During the intervention phase, researchers approached young people in the waiting room to participate in the study and complete an exit-survey post-consultation, in the same manner as in the TAU phase just described. This exit survey had the same questions as those in the TAU phase, with additional items related to Check Up GP, as described in Table 3.1: acceptability, usability, overall opinion and willingness to use again in the future.

Phase 3: Post-intervention

At the end of the exit survey, participants were invited to participate in a follow-up post-intervention interview held within two weeks of their consultation at a mutually agreed time. The interview guide was in part informed by the themes emerging from the co-design workshops. The aim of these interviews was to explore young people's experience of using Check Up GP, including how it affected the consultation and their relationship with their GP, and whether they would like to use the app again in the future.

The interview schedule for young people was as follows:

A. Administration

1. Can you begin by talking about your experience of using Check Up GP?
2. Do you remember what your initial reaction was when it was sent to you by SMS?
3. Did you complete it at home? Do you have a preference of where you'd like to fill it out?
4. Do you feel that the purpose was adequately described to you? (How was it described to you?)

5. Could you describe how comfortable were you using Check Up GP to disclose personal information about yourself? Can you explain why?
6. Do you think that Check Up GP gave an accurate picture of yourself to your doctor? Why/why not?
7. Were there any items that you lied about? (You don't need to tell me which ones). If so, why?
8. Did you feel like you had enough privacy when using it?

B. Consultation

1. Were there any surprising or unexpected things about using it? Did you learn something you didn't know?
 - a. Did you think there were any benefits or positives to using it?
2. Any downsides? Was there anything about it that you found challenging or made you feel uncomfortable or upset?
3. How did the doctor refer to and address any issues or concerns that were raised?
 - a. Would you have had that sort of discussion with the doctor if the app wasn't there?
4. Did your doctor talk with you about prevention – ways to improve your health?
5. Overall, did using the app change your understanding of the scope of issues you could discuss with the doctor at all? How?
6. Do you think you would change your behaviour or think about changing behaviour based on your discussion?

C. Future use of app

1. Are there any improvements you would like to see to Check Up GP that might improve the experience of using it? (this could include administration, questions, design)
2. Other functionality or features you'd think would be good? (e.g. tracking over time)
3. Is there anything else you'd like to tell us about your experience of using Check Up GP?

3.5.6.2 Study 3b: Implementation study

For the implementation component of my effectiveness-implementation study, I conducted an in-depth implementation case study of Check Up GP in one general practice clinic, with methodology informed by the action research approach. Action research aims to involve stakeholders in the implementation of change and generation of knowledge in a real-world setting through a cyclical process of collecting, feeding back and reflecting on data (Brydon-Miller et al., 2003; Hampshire et al., 1999). A Plan-Do-Study-Act (PDSA) framework of continuous quality improvement was used to help the clinic structure the iterative improvement of Check Up GP and its administration in rapid quality improvement cycles (Langley et al., 1996). The PDSA framework has the advantage of being recommended to general practices for use in quality improvement activities by the Royal Australian College of General Practitioners, the peak accredited body for general practitioners in Australia (Royal Australian College of General Practitioners, 2012). The study received ethics approval from the University of Melbourne (Ethics ID #1544281) (Appendix D).

At the start of the study period, all participating GPs and support staff met me and my supervisors and were given an overview of the study. In accordance with the iterative and participatory nature of the action research approach, I worked closely with staff during the intervention period, to observe, provide feedback on observations, and facilitate improvements to the process in rapid quality improvement cycles. A researcher was always present in the practice's waiting room during the intervention to carry out the first-hand observation of the implementation process and to collect research data from young people and parents. The intention was that improvements to the app and its administration would be refined regularly through the intervention phase according to these observations and feedback from staff.

During the two-month implementation phase the researchers communicated regularly with the practice manager and met twice with the GPs during a 30-minute lunch break, using the PDSA framework as a structure for quality

improvement discussion. At these meetings I presented a summary of results from youth exit surveys to that date, including rates of youth-rated patient-centred care and disclosure. I then asked staff to reflect on, identify and resolve challenges or problems with either the implementation or the app itself. These meetings also provided an opportunity to share feedback on initial findings, ensure the practice remained engaged, and celebrate successes. Based on staff needs, changes were made to the app and how use of the app was implemented by staff. These changes are reported in Chapter 7. I was unable to meet with receptionists as a group due to work demands, so ad hoc sessions were run with individual receptionists during quiet times in the waiting room. I also distributed a number of supporting documents to receptionists: a 'Frequently Asked Questions' document to clarify and reiterate procedures, such as recommended phrases to use when informing young people about the app; and a summary of anonymized results from young people's exit surveys, including ratings of disclosure and patient-centred care.

For measures in the implementation component of the effectiveness-implementation study, I conducted semi-structured interviews and focus groups with all four GPs and seven support staff at the end of the implementation period (see Table 3.2). Extensive field notes were made by me and two research assistants throughout the implementation period, recording observations of how support staff and GPs were using the app within their day-to-day work, and the occasions on which they needed to: remind staff on implementation procedure; assist staff with technology issues; and assist reception with the administration of Check Up GP to young people. I also took field notes of observations immediately after each meeting or training session with staff. Observation data, such as provided by field notes, allows rich insights into the interaction between technology, time, place, space and human action and interaction in complex and fast-paced health care settings (Trisha Greenhalgh & Swinglehurst, 2011).

Table 3.2: Study 3b Interview schedule for GPs and practice staff mapped to NPT core constructs

NPT core constructs	GPs	Practice support staff
Coherence (making sense of intervention)	Can you talk about your experience of using the app with young people? How did using the app differ from existing/previous practice with young people?	Can you tell me in your words, what the purpose of Check Up GP app is? What do you think were the benefits of using the app for young people? For GPs?
Cognitive participation (commitment and engagement)	Did your opinion of using Check Up GP change over time?	Did your opinion of using Check Up GP change over time? Do you think administering new technology like this fits under your job description?
Collective action (work to make intervention function)	What were some of the challenges in integrating Check Up GP into your practice? What are the possible solutions for these? How did you have to adapt or change your work? Did it help or impede your work? How much extra work did it require from you? Did this change over time at all?	Can you talk about your experience of administering the app? Did you have to adapt or change your work? Did it help or impede your work? How much extra work (time, additional tasks, learning to use it etc.) did it require from you? Did this change over time at all? What were some of the challenges in using the app? What are solutions for this? Were there any surprising or unexpected things about your role in administering it?
Reflexive action (reflection of the intervention)	What were the benefits of using the app with young people?	Would you see it as something the practice should continue to use?

	Did it have an impact on the way you communicated with young people? Did it raise any issues outside the scope of your usual consults with young people? Did it affect the communication with parents? Would you see it as something you/the practice should continue to use in your regular practice with young people? What would it take to make this possible?	Is there anything else you'd like to say (or ask) about the app or ways to improve its administration in general practice?
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3.5.7 Reimbursement

Each young person who completed an exit survey received one AUD\$10 gift voucher. Youth participants who were interviewed received an additional AUD\$30 gift voucher. The clinic received AUD\$2,000 for their involvement (AUD\$1,000 each at the beginning and the end of the study) and each support staff member received a AUD\$100 gift voucher at the end of the study in recognition of the additional work required of them to participate in the study. Involvement in the study was also an approved activity of the Quality Improvement and Continuing Professional Development program for GPs.

3.5.8 Analysis

Quantitative data from youth exit surveys were analysed using SPSS version 23. Youth participant characteristics in TAU and intervention groups were compared using the Chi Square test for independence. Where assumptions of expected cell frequency were not met, Fisher's Exact Test was used. Data from all scaled variables showed major deviation from the normal distribution. Transformation did not adequately improve normality, so the non-parametric Mann-Whitney U analysis was used to compare groups for all variables. The Mann-Whitney U test

has the added advantage of being suitable for unequal sample sizes. In comparing disclosure ratings between groups, 'not-applicable' responses were not included in the analysis. Scores for patient-centred care items were combined into five core components of the patient-centred model as described by Little et al. (2001) (Little et al., 2001a): communication and partnership; personal relationship; health promotion; positive and clear approach to problem; and interest in effect on life. Items for disclosure and patient-centred care were also combined to create a total disclosure and patient-centred care score. Internal consistencies of the following were calculated using Cronbach's alpha: items in each of the four patient-centred core factors; total patient-centred care; and, total disclosure. Effect sizes for all Mann-Whitney U analyses were calculated and reported as r with magnitudes using Cohen's criteria (.1=small, .3=medium, .5=large) (Cohen, 1988).

I audio-recorded my face-to-face Interviews with GPs and support staff and had them transcribed verbatim by a professional transcription service. I listened to all interviews to ensure the transcripts accurately reflected the audio recordings before coding all field notes and transcripts using NVivo 11 software (QSR International, Melbourne). My supervisors used the subsequent coding framework to independently code two transcripts: an interview with a GP and an interview with a receptionist. We then met to compare codes, revising the coding structure as required. Subsequently, I recoded all transcripts using the updated coding framework, before conducting a thematic analysis (Braun & Clarke, 2006), with themes then mapped to the corresponding core NPT constructs. I met regularly with my supervisors, of whom one is also a practicing GP, to discuss emerging themes and resolve any differences until a final set of themes was agreed upon.

I used descriptive statistics to analyse the number of times researchers: reminded staff of implementation procedure; assisted staff technology issues; and, assisted reception with the administration of *Check Up GP* to young people.

3.6 Ethical consideration

The main ethical consideration of my research program was that of the consent process for participants aged under 18 in Study 3 and whether these adolescents would need parental consent. The National Statement on Ethical Conduct in Human Research developed by the National Health and Medical Research Council (NHMRC) in Australia provides guidelines for the ethical design, conduct, and dissemination of results in human research, including young people and children. The NHMRC's most recently updated guidelines released in 2015 allows young people only to provide consent if the young person has sufficient maturity to understand the relevant information, including whether it would be contrary to their best interests to seek consent from parents (National Health and Medical Research Council, 2018). This position accords with studies that show that young people have the capacity to consent to participate to research (Santelli et al., 2003). The position also reflects that of the United Nations Conventions on the Rights of the Child, which states that young people have the right to make their own decisions on matters affecting them, in accordance to their age and maturity (United Nations Committee on the Rights of the Child, 2013).

Requiring parental consent in Study 3 had the potential to have a negative impact on both young people's care and result in a sampling bias. This risk was highlighted by a meta-analysis of studies of adolescent risk behaviour that found requiring active parental consent in research studies resulted in lower response rates, lower rates of self-reported substance use, and the participation of fewer males and older adolescent participants (Liu, Cox, Washburn, Croff, & Crethar, 2017). Thus, requiring parental consent for my final study would have potentially undermined the validity of my research.

While the NHMRC guidelines suggest that researchers assess young people's maturity and capacity to consent, I did not feel this was appropriate for my study. I did not feel that I had either sufficient expertise or sufficient time to undertake this task due to having to recruit young people in the waiting room immediately before their consultation. Instead, I decided that the young person's GP would be the best-

placed person to do this assessment, filling out a simple form at the start of the consultation that was then returned to me, as described above. GPs regularly have to assess young people's maturity to understand and consent to medical procedures. In addition, GPs in this clinic generally have built up a relationship and understanding of their patients, often over a number of years.

3.7 Chapter and section summary

This Methodology chapter concludes Part One of this thesis. In this chapter I have outlined the methodology I used in my research to comprehensively investigate the design and implementation of a health and lifestyle screening app for young people in general practice. Underpinned by the three conceptual frameworks of co-design, the MRC's Complex Interventions Framework, and Normalisation Process Theory, I described why I selected a mixed methods multiphase design. I then explained the methods of each my three major studies: a systematic review; co-design workshops; and, an effectiveness-implementation case study. I ended the chapter with a discussion of how I addressed the main ethical consideration of my research, that of permitting mature minors to consent without also requiring the consent of parents.

Next, in Part Two of my thesis, I present the findings of my three studies in four chapters, published during my candidature as peer-reviewed journals articles:

- Chapter 4: Does screening for and intervening with multiple health-compromising behaviours and mental health disorders amongst young people attending primary care improve health outcomes? A systematic review
- Chapter 5: Designing a health screening tool to help young people communicate with their general practitioner
- Chapter 6: Improving patient-centred care for young people in general practice with a co-designed screening app: Mixed methods study

- Chapter 7: Experiences of general practitioners and practice support staff using a health and lifestyle screening app in primary health care: Implementation case study.

In Part Three of my thesis, consisting of Chapter 8, I present a synthesis of the research findings, strengths, and limitations to the research, and implications for policy. Finally, in this final Chapter, future research avenues are suggested that would build on the findings from my research and concluding comments are made on my research and its significance.

PART TWO

4 Does screening for and intervening with multiple health-compromising behaviours and mental health disorders amongst young people attending primary care improve health outcomes? A systematic review

4.1 Chapter overview

In this chapter I present the first of four papers published during my candidature. The paper is a systematic review that investigates whether screening and subsequent interventions for multiple health-compromising behaviours and mental health disorders in primary care settings improve the health outcomes of young people. For each of the nine studies that met the inclusion criteria, I present and assess the screening tool, study design and setting, intervention, outcomes measured, and findings. The discussion explores the implications of my findings for the health care of young people in clinical settings, as well as suggestions for further research. The paper was peer reviewed and published in *BMC Family Practice* in August 2016. The chapter concludes with a summary of the key findings related to research question 1 of this thesis.

4.2 PDF of paper

RESEARCH ARTICLE

Open Access



Does screening for and intervening with multiple health compromising behaviours and mental health disorders amongst young people attending primary care improve health outcomes? A systematic review

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Abstract

Background: Adolescence and young adulthood are important developmental periods. Screening for health compromising behaviours and mental health disorders during routine primary care visits has the potential to assist clinicians to identify areas of concern and provide appropriate interventions. The objective of this systematic review is to investigate whether screening and subsequent interventions for multiple health compromising behaviours and mental health disorders in primary care settings improves the health outcomes of young people.

Methods: Using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines, literature searches were conducted in Medline, PsycINFO, Scopus and Cochrane Library databases (Prospero registration number CRD42013005828) using search terms representing four thematic concepts: primary care, young people, screening, and mental health and health compromising behaviour. To be eligible for inclusion, studies had to: include a measure of health outcome; include at least 75 % of participants aged under 25 years; use a screening tool that assessed more than one health domain; and be conducted within a primary care setting. Risk of bias was assessed using the Quality Rating Scale.

Results: From 5051 articles identified, nine studies fulfilled the inclusion criteria and were reviewed: two randomised controlled trials (RCTs), one pilot RCT, two clustered RCTs, one randomised study with multiple intervention groups and no control group, one cluster RCT with two active arms, one longitudinal study and one pre-post study. Seven studies, including two RCTs and one clustered RCT, found positive changes in substance use, diet, sexual health or risky sexual behaviour, alcohol-related risky behaviour, social stress, stress management, helmet use, sleep and exercise. Of only two studies reporting on harms, one reported a negative health outcome of increased alcohol use.

Conclusions: There is some evidence that the use of screening and intervention with young people for mental health disorder or health compromising behaviours in clinical settings improves health outcomes. Along with other evidence that young people value discussions of health risks with their providers, these discussions should be part of the routine primary care of young people. Further quality studies are needed to strengthen this evidence.

Keywords: Adolescent, Screening, Primary care, Health compromising behaviour, Mental health, Prevention

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Background

Health compromising behaviours and mental health in adolescence

Adolescence is an important developmental period for physical, cognitive, social and emotional growth. It is also a time when health and lifestyle habits and behaviours that influence adult health are initiated [1]. The terms adolescent, youth, teenager and young people are defined by different age ranges but also tend to be used interchangeably. A comprehensive overview of adolescent development presents a contemporary argument in favour of grouping these terms because the age range of 10 to 24 years captures the physical and psychosocial changes that typically occur in transition from childhood to adult maturity [1]. Hence, unless otherwise stated, the term *young people* is used in this article to refer to those aged 10 to 24.

In young people aged 10 to 24 substance use, poor diet, lack of exercise and mental disorders are the causes of significant disability [2]. Seventy-five per cent of mental illnesses begin before the age of 25 years with one in four young people experiencing mental health disorders, most commonly anxiety, affective disorders and substance use disorders [3]. These health compromising behaviours and mental health disorders are likely to co-occur and have the potential to adversely affect physical and mental health, and development [4].

Opportunities for detecting health compromising behaviours and mental health disorders in primary care

Despite the high prevalence and co-occurrence of health compromising behaviours and mental health disorders, few young people seek professional help or support [5]. In Australia and worldwide, around 70 to 90 % of young people attend primary care at least once within a 12-month period [6, 7]. Whilst these consultations most commonly occur for physical complaints [7, 8], this regular attendance suggests that primary care practitioners are in the unique position to deliver opportunistic screening for mental health and health compromising behaviours as part of young people's routine health care, providing early intervention and referrals where necessary. Indeed, more than 80 % of primary care practitioners agree that they should be responsible for identifying mental health disorders, substance abuse and behaviour problems in young people [9]. Young people also report wanting to discuss these sensitive issues with their primary care practitioner [10].

Barriers to screening for and intervening with health compromising behaviours and mental health disorders in primary care

There are a number of major barriers to screening for and intervening with health compromising behaviours

and mental health disorders in the health care setting. Practitioners report barriers to preventive care as including a lack of time to screen multiple health areas [11], feeling uncomfortable raising sensitive issues that are not the presenting issue [12], lack of awareness or skill [13], and a lack of confidence and self-efficacy in managing issues with young people [14]. Young people report concerns about embarrassment in disclosing health concerns and a lack of knowledge about available services [7, 15, 16]. The lack of private and confidential settings are also a barrier; young people who spend time alone with their primary care practitioners are more likely than those who do not to discuss sensitive topics [17].

The identification of emotional distress by primary care practitioners is highly correlated with young people recognising and expressing that they have a problem [18]. Apart from efforts to increase mental health literacy amongst young people, a screening framework that facilitates discussion of health and lifestyle is likely to increase disclosure and enhance engagement [19]. While screening for health compromising behaviours and mental health disorders do not strictly mirror screening for a disease process with a known pre-disease phase (for example dysplastic cells predating carcinoma in situ), peak health bodies recommend screening young people for health compromising behaviours and mental health disorders in primary practice [20–22]. Screening facilitates early intervention or preventive counselling efforts as young people do not often volunteer these issues as concerns to their health care providers [7].

Available tools for screening for health compromising behaviours and mental health disorders and useful interventions

There are many screening tools for young people that focus on individual health domains, such as substance use [23], depression [24] physical activity [25] and suicide risk [26]. However, the use of tools or frameworks that enable screening of multiple health domains have a potential advantage as they address the co-occurrence of health compromising behaviours and mental health disorders in young people [27–29]. The United States and Australia have national guidelines for prevention and health promotion services to young people in primary care [21, 22]. These guidelines are age-appropriate and cover multiple and related domains, including physical health, social and academic competence, emotional well-being, risk reduction and violence and injury prevention. They allow primary care practitioners to normalise sensitive issues, guide discussion about behaviour and promote healthy lifestyle behaviours [30], in addition to increasing recognition of health problems that may otherwise go undetected [31].

Screening typically does not occur in isolation and, as recommended by national guidelines, should be followed up with appropriate interventions such as motivational interviewing [32], referrals to specialty care [33] or the provision of health education materials [34]. There is evidence to suggest that interventions for specific detected health issues in young people can improve depression symptoms [35], decrease weight in the obese [36] and reduce sexually transmitted infections [37]. Given these advantages, screening followed up by appropriate intervention in the primary care setting can be conceptualised as a health promotion strategy.

Evidence for benefits of screening and intervening for multiple and commonly co-occurring health compromising behaviours and mental health disorders

Despite the potential benefits of screening for and intervening with multiple and commonly co-occurring health compromising behaviours and mental health disorders, there have been few studies that investigate the actual health impacts of interventions across multiple behavioural or risk areas. One systematic review of clinical trials by Moyer et al. [38] found that there was limited evidence to support screening and preventive interventions in young people and called for more studies in the area. A more recently published systematic review by Hale et al. [39] found that interventions for multiple risk behaviours were effective and comparable to those interventions targeting single risk factors. However, this review excluded terms for primary care and did not include young adults aged 20 to 25, who have a higher prevalence of significant health risks compared to younger adolescents [40]. Given that preventive care of young people continues to be recommended as best practice to primary care practitioners [21, 22], and central to well-care visits, it is timely to update the evidence in this setting.

This systematic review aims to investigate whether screening and subsequent interventions for multiple health compromising behaviours and mental health disorders in primary care settings improves the health outcomes of young people.

Methods

A systematic literature review was conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) guidelines [41] and registered on the PROSPERO website (<http://www.crd.york.ac.uk/prospero/>, registration number CRD42013005828). A search was conducted on 18 November, 2015 on Medline, PsycINFO, Scopus and the Cochrane Library databases using search terms representing four thematic concepts: primary care, young people, screening, and mental health and health compromising behaviour (details described in

Additional file 1: Appendix 1). The reference lists of all relevant studies and reviews were also manually searched.

Individual health outcome measures were not specified in the inclusion criteria. An exhaustive search of the databases had previously been undertaken that listed individual health compromising behaviours and mental health disorders in the search terms. However this was found to be impractical as most papers returned were for individual health conditions rather than for multiple domains. Instead broader terms were tested (e.g. 'mental disorders' rather than 'depression,' 'anxiety' 'schizophrenia' etc.) and papers more relevant to the objectives were found. In addition, the original intention, as stated in our Prospero Registration Form, was to exclude young people with pre-existing health conditions. However, a preliminary look at the literature returned such a small number of results that it was felt it would be reasonable to remove this exclusion criterion and in doing so acknowledge the differences in these participants in the results and discussion, including the potential limitations in generalizability.

To be eligible for inclusion studies had to: include a measure of health outcome; include at least 75 % of participants aged 25 years and under; use a screening tool or approach that assessed more than one health domain, which may have included at least one measure of behaviour modification, such as drink driving, and; be conducted within a primary care setting. As suggested by Linde et al. [42], this review included uncontrolled trials and qualitative studies to obtain an overview of the topic and inform future research. Studies were excluded if they did not evaluate health outcomes.

The first author (MW) examined all titles and abstracts extracted for relevance and read the full text of any potentially eligible articles. Articles that met the exclusion criteria were removed. The second author (SK) confirmed that all selected articles were eligible for inclusion. MW extracted data from the studies using the form described in Table 1, which was confirmed by SK. Risk of bias within each study was assessed using the Quality Rating Scale (QRS) [43]. The QRS is a 23-item instrument for the assessment of the quality of clinical trials, covering both internal validity (control of bias) and external validity (generalisability). A key advantage of the QRS over other rating scales is that it is suitable for the appraisal of non-randomized trials. Each item of the QRS is rated 0 to 2 with a total instrument range of 0 to 46; higher scores indicating better quality. The first two authors used the QRS independently. One of the potential limitations of the QRS is that it may have only moderate inter-rater agreement [43], hence inter-rater reliability was assessed by Cohen's absolute weighted kappa statistic in Stata Version 12.0. Weighted kappa allows for different levels of agreement in ordered data,

Table 1 Screening tool, sample, study design, setting, intervention type, health outcomes measured, and findings of the included studies

Study	Screening tool	Sample/study design, setting	Intervention and outcomes measured	Findings	QRS ^a
Chen et al. (2011) [45]	Face-to-face (trained researchers with computer-assisted personal interviewing technology), private room within clinical setting, eligibility screen Domains screened: • substance use • sexual risk • medication adherence	N = 142, 16–24 years, primary care clinic for HIV positive young people, 5 sites, 45 % female, HIV positive with at least 2 of 3 HIV risk behaviours, RCT	4 × 60 minute motivational interviewing (MI) sessions focused on 2 most problematic behaviours by mental health clinicians Outcomes measured: • no condom use behaviour • risk of no condom use behaviour	Improvement: • no condom use for participants categorised as at increased sexual risk (adjusted B = .364, $p < .01$) and those categorised as not at risk (adjusted B = .325, $p < .01$) • low sexual risk (63 % vs. 32 %, $p < .01$) and likelihood to be in delayed high sexual risk group (16 % v 50 %, $p < .01$)	35.5
Mason et al. (2011) [46]	Face-to-face (trained interviewer), clinic waiting room, eligibility screen Domains screened: • substance use (incl. drink driving) • mental health	N = 28, 14–18 years, general primary care, 1 site, 100 % female, African American with at least 1 substance use risk, pilot RCT.	1 × 20 min MI session with a social network component by trained interviewers (not clinical staff) Outcomes measured: • substance use • trouble due to alcohol • substance use before sex • social network quality • offers to use marijuana • social stress • readiness to start counselling	Improvement: • substance use before sex ($F(1) = 4.870$, $p = .038$, $\eta^2 = 0.18$) • social stress ($F(1) = -0.187$, $p = .047$, $\eta^2 = 0.16$) • trouble due to alcohol use ($F(1) = 4.301$, $p = .049$, $\eta^2 = 0.15$) • offers to use marijuana ($F(1) = 4.222$, $p = .047$, $\eta^2 = 0.14$) No change: • substance use • social network quality • readiness to start counselling	22
Olson et al. (2008) [52]	Digital (PDA) self-administrated, waiting room, intervention screen Domains screened: • diet • exercise • screen time • substance use	11–20 years, general primary care, two cross-sectional sample recruited pre and post intervention within 5 sites and completed baseline and 6 month follow up survey. Usual care group prior to intervention: N = 148, 47 % female Participants recruited 1 year after intervention introduced in practices: N = 136, 50 % female	1 × brief MI session by trained clinician within consultation. Outcomes measured: • exercise • fruits and vegetables • milk intake • sweetened beverages • screen time	Improvement: • exercise scores between intervention (0.581) and control (-0.220 , $p = .006$) • milk intake between intervention (0.190) and usual care (-0.313 , $p = .012$) ^b No change: • fruit and vegetables • sweetened beverages • screen time	23.5
Ozer et al. (2011) [51]	Pen/paper, self-administrated, waiting room, intervention screen Domains screened: • seat belt and helmet use • substance use • sexual behaviour	14 years, paediatric clinic Longitudinal study (N = 904) compared with several cross-sectional surveys (safety N = 579, sexual behaviour N = 1306, substance use N = 1410)	2 × clinical encounters: 1. provider intervention following '5 A' framework for behavioural counselling; 2. health educator intervention 15–30 min informed by social cognitive theory Outcomes measured: • seat belt use • helmet use • tobacco use • alcohol use • drug use • sexual behaviour	Improvement: • helmet use (OR = 2.0, 95 % CI = 1.1, 3.7, $p \leq .05$). No change: • smoking • alcohol • drug use • sexual behaviour	28
Patrick et al. (2006) [44]	Computer, self-administrated, immediately before intervention in the clinical office, intervention screen Domains screened: • diet • exercise	N = 819, 11–15 years, general primary care, 6 sites, stratified by gender (53 % female), RCT with sun exposure protection as control group. Participants booked in for a well care visit	A 12-month intervention consisting of a computer-assisted stage of readiness-based goal setting followed by brief health care provider counselling, a printed manual and 12 months of monthly mail and telephone counselling, parent intervention to help encourage change in diet and physical activity Outcomes measured: • calories from fat • fruit and vegetable servings • sedentary behaviour • minutes per week exercise	Improvement: • sedentary behaviours per week for girls (% change was -12 % for intervention and 4.8 % for control group, $p = .001$) and boys (% change was -24 % for intervention and 2.4 % for control group, $p = .001$) • physical active days per week for boys (relative risk, 1.47, 95 % CI: 1.19, 1.75) compared to the control group No change: • calories from fat	34

Table 1 Screening tool, sample, study design, setting, intervention type, health outcomes measured, and findings of the included studies (*Continued*)

			• days per week exercise	• fruit/vegetables • minutes of physical activity per week	
Sanci et al. (2015) [48]	Practitioner (in consultation)- or self-administrated (waiting room), pen/paper, intervention screen Domains screened: • diet • exercise • substance use • mental health • violence and safety (incl. drink driving)	N = 901, 14–25 years, general primary care, 40 sites, 76 % female, pragmatic clustered RCT stratified by postcode advantage score and billing type	Intervention: Clinician training (9 h) in health risk screening, motivational interviewing, youth friendly practice; 2 × clinic visits. Comparison: Didactic educational seminar in youth and health risk screening Outcomes measured: • tobacco use • alcohol use • illicit drug use • risk of STI • risk of unplanned pregnancy • road safety • emotional distress	Improvement: • illicit drug use at 3 months (RD -6.0, CI: -1.1, -1.2; OR 0.52, CI: 0.28, 0.96) • risk for STI at 3 months (RD -5.4, CI: -11, 0.2; OR 0.66, CI: 0.46, 0.96) • unplanned pregnancy at 12 months (RD -4.4; CI: -8.7, -0.1; OR 0.40, CI: 0.20, 0.80) No change: • tobacco use • alcohol use • road safety • emotional distress	40
Stevens et al. (2002) [50]	Self-administrated pen/paper, subject home, intervention screen (in both intervention arms) Domains screened: • substance use • seat belt and helmet use • gun access and use	N = 3525 ^c , paediatric clinic, 12 sites, 46 % female, 5 th and 6 th grade adolescents and parents, clustered RCT with two active arms	1 of 2 interventions: 1. home interventions (parent discussed risk with child and developed plan) plus practice intervention included MI. 2. site visits, newsletters, telephone calls; printed material Outcomes measured: • alcohol use • tobacco use • seatbelt use • helmet use • gun storage	No change: • tobacco use • seatbelt use • gun storage Negative effect: • Increased alcohol use at 24 and 36 months; OR = 1.27, 95 % CI: 1.03, 1.55, $p = .02$ and OR: 1.30, 95 % CI: 1.07, 1.57, $p = .01$, respectively	29.5
Walker et al. (2002) [47]	Face-to-face (nurse), unspecified location, intervention screen Domains screened: • mental health • physical health • substance use • diet • exercise • sexual health knowledge • health damaging behaviours	N = 1516, 14–16 years, general primary care, 8 sites, 51 % female, clustered RCT	1 × 20 min consultation with nurse to discuss health concerns & develop plans for healthier lifestyles based on self-efficacy and behaviour change Outcomes measured: • diet • exercise • tobacco use • alcohol use	No Change: • smoking • alcohol use • exercise • diet	26.5
Werch et al. (2007) [49]	Computer, self-administrate, immediately before intervention in quiet clinic office, intervention screen (in all 3 intervention arms) Domains screened: • exercise • diet • sleep • stress management • substance use	N = 155 ^c , student health care, 1 site, 66 % female, 3 arms randomised trial	1 of 3 interventions from trained research staff: 1. multiple behaviour health contract based on Behavior-Image Model; 2. 1 × 25 min tailored consultation with fitness specialist; or 3. a combined consultation plus contract intervention Outcomes measured: • alcohol use • tobacco use • marijuana use • drink driving • exercise	Improvement: • drink driving behaviours in all groups (F(2136) = 4.43, $p = .01$) • exercise behaviours in all groups, (F(5140) = 6.12, $p < .001$) • nutrition habits in all groups, (F(3143) = 5.37, $p < .001$) • sleep habits in all groups (F(2144) = 5.03, $p = .01$), and health quality of life, (F(5140) = 3.09, $p = .01$) • Stress management F(2144) = 5.48, $p = .01$, and the number of health behaviour goals set in the last 30 days, F(2143) = 5.35,	25.5

Table 1 Screening tool, sample, study design, setting, intervention type, health outcomes measured, and findings of the included studies (*Continued*)

	• diet • sleep • quality of life • self-control • stress management	$p = .01$, but only among adolescents receiving the consultation, or consultation plus contract No change: • alcohol use • tobacco use • marijuana use • quality of life • self-control
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^aAverage score on the Quality Rating Scale between the two raters

^bt-tests conducted on average change in health behaviours, however no statistical detail provided

^cAge range not provided

and the absolute function allows for all numbers including those unassigned by either rater.

The studies were also compared to determine whether there were similarities in the country of research, research group, or years in which the research was conducted. All studies were included irrespective of their design, quality, and biases. No statistical analyses were conducted due to the heterogeneity of study designs permitted in the inclusion criteria. Instead, we favoured narrative description of the data including statistical analyses used where appropriate.

Results

Summary

A total of 5051 articles were identified through the literature search, of which 1103 were excluded due to duplication, 3875 were excluded based on abstracts and a further 64 excluded after the full article length was examined, leaving a total of nine studies to review. Figure 1 depicts the PRISMA flow diagram for inclusion.

Study characteristics

Nine publications met the inclusion criteria: Two were randomised controlled trials (RCTs) [44, 45], one was a pilot RCT [46], two were clustered RCTs [47, 48], one was a randomised study with multiple intervention groups and no control group [49], one was a cluster RCT with two active arms [50], one was a longitudinal study [51] and one was a pre-post study [52]. The majority of participants were patients at paediatric primary care [50, 51] or primary care practices [44, 46–48, 52]. Other settings were a primary care clinic at a large university [49] and primary clinics for adolescents with HIV within major metropolitan hospitals [45]. The characteristics of each study are presented in Table 1.

Interventions

In addition to administering a screening tool, each study included one or more interventions involving individualised motivational interviewing or counselling

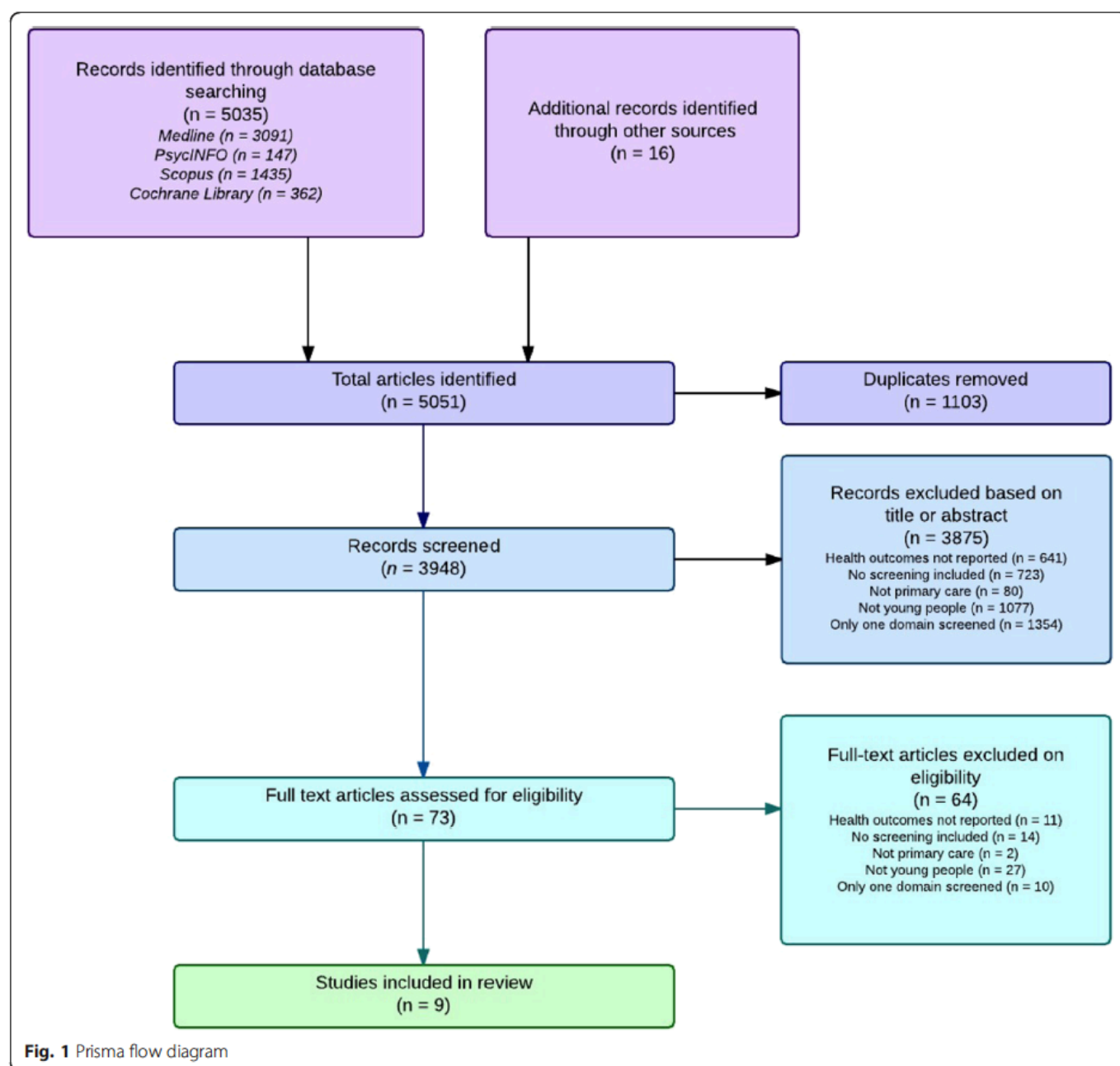
sessions. In seven studies [44, 47–52] the screening tool was completed as part of the intervention. The remaining two studies used the screening tool as part of the eligibility process to identify those with a risk factor who then went on to be randomised to receive the intervention or not [45, 46]. Four studies targeted individuals with increased risk of developing a disorder [47, 50–52], two targeted individuals with early signs of problems or disorder [45, 46], and three targeted all young people [44, 48, 49].

Participants

Two studies consisted of almost all white Caucasian participants [47, 52] and five studies had a mix of Caucasian, African-American, Hispanic and/or Asian participants [44–46, 49, 51]. Stevens et al. [50] and Sanci et al. [48] did not report ethnicity details. One study was focused only on female participants [46], and the remaining seven studies involved 46–76 % of females [44, 45, 47–52]. Seven of the studies reported the mean age of participants, which was 15.6 years overall [44–47, 49–51], with the study by Olson, Gaffney, Lee, & Starr [52] reporting an age range of 11–20 years and Sanci et al. [48] reporting an age range of 14–24. Two of the nine studies examined interventions that were targeted toward at risk adolescent populations; Chen reported on effects of an intervention in a group of adolescents with HIV [52] and Mason reported on the effects of an intervention for African American adolescent females screening positive for alcohol use [53].

Screening tools

As outlined in Table 1, participants in six of the studies self-administered the screening tools [44, 48–52], with three of these completed via a digitised system (Personal Digital Assistant [52] or computer [44, 49]). In seven studies, screening took place in a waiting room immediately before a consultation or intervention [44, 46–49, 51, 52], one was completed at an unspecified time prior to the intervention [45] and one was sent to the participants' homes and completed by young people and their



parents [50]. As a pragmatic study, Sanci et al [48] gave clinics the option of having practitioners administer the screening tool face-to-face or self-administered by young people in the waiting room. In two of the nine studies, the screening component was undertaken to test for participant eligibility for the study of the effectiveness of the intervention component [45, 46]. In the remaining seven studies the screening component was part of the intervention being tested.

Across the studies there were 11 health compromising behaviour or mental health domains used in the screening tools: substance use; mental health; physical health; diet; exercise; medication adherence; screen time; sexual health or behaviour; health damaging behaviour; sleep; and, safety (violence, gun access and use, helmet or

seatbelt use). In addition, the study by Sanci et al. included screening items on home environment, activities and peer relationships, and education [48]. The screening tool of six studies had screening tools with between three and seven domains [45, 47–50, 52] and two studies had two domains [44, 46]. Substance use (tobacco, marijuana, and/or alcohol) was the most included domain [45–52], followed by exercise [44, 47–49, 52] and diet [44, 47–49, 52].

Changes in health compromising behaviours and mental health disorders

Studies measured a range of outcomes in health compromising behaviours and mental health: diet, exercise, substance use, risky behaviour due to substance use,

exercise, screen time, safety (violence, gun access and use, helmet or seatbelt use), sleep, quality of life, and sexual health or behaviour. In addition, studies also measured behaviours that may influence health compromising behaviours and mental health disorders: readiness to start counselling, social stress, and social network quality. Seven of the nine studies reported improvements in health compromising behaviours or mental health outcomes of young people in the intervention group compared to those in the control or comparison group [44–46, 48, 49, 51, 52]. Even though studies measured multiple outcomes, most studies did not report significant improvements in all outcomes measured, see Table 1. One study reported improvements in five outcomes (out of ten measured) [49], one study reported improvements in four outcomes (out of seven measured) [46], one study found improvements in three outcomes (out of seven measured) [48], three studies reported improvements in two outcomes [44, 45, 52] (out of five, two and five outcomes respectively), and one study found improvement in one outcome (out of six measured) [51].

Improvements in health outcomes were found in substance use [46, 48, 49], diet [49, 52], sexual health or risky sexual behaviour [45, 48], alcohol-related risky behaviour [46, 49], social stress [46], stress management techniques [49], helmet use [51], sleep [49], and exercise [44, 49, 52]. In addition, the study by Stevens et al. [50] reported a negative outcome; alcohol use increasing at 24 and 36 months of the intervention arm focussed on alcohol and tobacco use (OR = 1.27, 95 % CI: 1.03, 1.55, $p = .02$ and OR: 1.30, 95 % CI: 1.07, 1.57, $p = .01$, respectively). Table 1 describes study outcomes in detail.

Assessment of bias

The QRS for both raters ranged from 20 to 40, out of a possible maximum score of 46, and had similar means. Interrater agreement was higher (95.2 %) than the expected agreement (83.3 %) with an acceptable kappa score (Rater one: $M = 29.33$, $SD = 6.10$, Rater two: $M = 29.44$, $SD = 6.09$, $\kappa = 0.71$, $SE = 0.202$, $p = 0.0002$). The average QRS for each study is listed in Table 1. The pilot RCT [46] and the pre-post study [52] scored low, between 22 and 24 for each rater, while the two RCTs [44, 45] and one of the cluster RCTs [48] scored highest, between 33 and 40 by both raters.

A number of biases were identified. There was a bias in terms of where the studies were conducted, with seven of the nine studies conducted in the United States [44–46, 49–52], one in the United Kingdom [47] and one in Australia [48]. All studies were published between 2002 and 2015, with four of the nine studies published within the last 5 years [45, 46, 48, 51]. Of the four RCT and clustered RCT studies [44, 45, 47, 48], only two

reported on concealment of allocation [45, 48]. Finally, only the study by Sanci et al. [48] reported on harms or side-effects that may have occurred during the study.

Limitations of the studies

The studies were limited by a range of methodological issues. The limitations were: a small sample size [45–47, 49, 52]; a self-selected sample, not representative and possibly biased [44, 52]; an insufficient length of follow-up time points [46, 49]; participant drop outs or non-responders [44–47, 52]; the use of potentially unreliable self-report measures [44, 45, 48]; a lack of longitudinal comparison group [51]; non-randomised design [51, 52]; multiple outcome measures carrying a greater risk of significant findings than by chance alone [46–49, 51, 52]; multiple interventions that made it difficult to determine the efficacious component [44, 48–51]; and the absence of a control condition [46, 49, 50].

Discussion

There were nine papers included in this review, all evaluating the effect of health compromising behaviour and mental health disorder screening and interventions on young people's health in primary care settings. Seven of these [44–46, 48, 49, 51, 52] suggested a positive change in some health outcomes, of which two were RCTs [44, 45] and one a clustered RCT [48], demonstrating reasonable support for the use of screening and intervention in primary care for young people.

A range of health compromising behaviours and mental health disorders were included in the screening component of these studies. However, only three studies screened for sexual health or behaviour [45, 48, 51], only three screened for drink driving [46, 48, 49] and only one study screened for violence [48]. As young people are at elevated risk of experiencing sexual health problems, road accidents and violence [1], there is a need to screen all young people for these issues in primary care.

Minimal information was provided about the format and administration of the screening tools, suggesting that the screening component was considered incidental or a less important component of the study by the authors. Whilst two of the studies included screening to identify individuals with health risks eligible for testing of the intervention [45, 46] we decided to retain these studies as screening was an essential component of case finding which would apply in real clinical practice should these interventions be administered. In the majority of studies [44–48, 50, 52] it was unclear if screening took place in a private space or in a waiting room where parents or others were present. Confidentiality and privacy are particularly important for young people in primary care consultations [53, 54], therefore

ensuring privacy is likely to increase disclosure by young people [55].

There was also a lack of information provided about how the electronic tools [44, 49, 52] were developed and designed, and whether end-users were consulted or involved in the design of the tool's content and functionality. Involving end-users in the design of technology ensures that the tool meets young people's needs and is contextually relevant [56]. There is increasing interest in how technology may be incorporated into primary care to enhance service delivery and health outcomes [57] and more research is required to understand its role in screening.

With the notable exception of the study by Sancu et al. [48], the samples included in this review were under 20 years of age [45, 46, 50–52] and most studies were conducted in the United States [44, 46, 47, 49–52] limiting generalisability of this review for other countries and health systems. As most studies included younger adolescents, the extent to which the results of this review can be extended to young adults aged 18 to 25 is unknown. Young adults have a higher prevalence of significant health risks compared to younger adolescents aged 12–17 and adults aged 26–34 [40]. This young adult population is also more likely to report not having a regular doctor and having a weaker sense of belonging to a local community, likely due to being socially isolated and to stressors from work and study commitments, compared to other age groups [58].

Only two studies reported on harms or negative effects that may have occurred during the study. Harms may include the additional costs and medical procedures associated with false-positive screening results, or a paradoxical increase in an unhealthy behaviour [38]. The study by Sancu et al. [48] reported no harmful events, while Stevens et al. [50] reported a negative outcome effect of increased alcohol use in the intervention arm focussed on alcohol and tobacco use. The Dartmouth Prevention Project reported by Stevens differed from the other studies in that included subjects were pre-adolescents in the fifth or sixth grade and their parents, and the intervention rested on encouraging communication between parents and children about health risks rather than the clinician communicating directly with an adolescent. Authors proffer that the observed results may have arisen from family discussions that may have been broader ranging than the topics in focus or that the intervention was insufficient to curb short term alcohol use; without follow-up into later adolescence when uptake of alcohol is greater, full effect on preventing use could not be evaluated. Future research needs to explicitly measure potential harms or risks in screening for and intervening with multiple health compromising behaviours and mental health disorders.

Limitations in the study designs may have minimised the generalisability of the findings. Three of the seven studies that detected a change in health compromising behaviour or mental health scored high in the QRS; two RCTs [44, 45] and one clustered RCT [48]. However, one of these RCTs was targeted at HIV positive young people [45], so results may not be replicable in a general population of young people attending primary care. In addition, of the four remaining studies that found improvements in health compromising behaviour or mental health, three had the lowest QRS scores of the nine studies: a pilot RCT [46], a pre-post design study [52] and a randomised trial with no control [49]. All of these studies had small sample sizes and high participant drop outs, while the study by Mason et al. [46] was targeted at urban African females, and both Mason et al. [46] and Werch et al. [49] had only 1 month follow ups.

Other limitations in study designs may have minimised the ability to detect a change in health compromising behaviour or mental health outcomes. For instance, Walker et al. [47] had small participant numbers in each domain that was measured, as well as high rates of non-response, particularly at 12 months, which may account for the lack of effectiveness observed in this study. Other important potential limitations are the challenges inherent in measuring changes in multiple health outcomes. It is difficult to obtain sufficient statistical power to show shifts in several outcomes and measuring multiple outcomes increases the potential for positive findings by chance alone [38]. It is hard to overcome this latter challenge without a combined risk variable, which also has drawbacks in that detail of which risks are affected and which are not is lost. It is noteworthy that not all outcomes targeted in these interventions changed; we did not view this negatively as it is highly unlikely a young person with co-occurring health risks will modify all behaviours simultaneously. Studies require longer follow-up times to test whether interventions have cumulative effects with subsequent exposures over time [55].

It is interesting to note that none of the studies assessed changes for known protective factors for young people's health, such as school engagement, employment and meaningful relationships [1, 59]. For example, family and school connectedness protect against emotional distress, suicidal thoughts and behaviours, violence, substance use and early age of initial sexual experience [13]. Conversely, there is an increased risk of dropping out of education associated with cannabis use, suicide attempts, depression and welfare dependence [60]. Identifying and discussing protective factors with young people is central to the strength-based approach which promotes healthy development and the reduction of health compromising behaviours [61]. The strength-based approach is recommended by national guidelines for the prevention and

health promotion services to young people in primary care [21, 22]. More research is needed to investigate the effectiveness of adolescent screening and intervention in primary practice which includes the identification and discussion of both health compromising and protective factors.

Several national guidelines recommend the use of screening tools and intervention with young people [21, 22]. However, while this review demonstrates that there is limited high quality evidence that screening across multiple health risks and intervention in primary care improves the mental health or health compromising behaviours of young people, there is evidence of modest impact with both high and lower quality studies showing positive shifts in some of the health domains they targeted. Is this sufficient to support the guideline recommendations? Some argue that sample sizes required to counter the challenges in measuring multiple outcomes from screening and associated interventions preclude trial methodologies and rather commend efficacy studies after widespread implementation [62]. Follow-up times are seldom long enough in trials to assess whether outcomes that take years to develop are prevented [38]. In addition the psycho-social risks that burden adolescents' health have complex aetiologies and require multifaceted interventions including school, peers, families and community, not just clinical settings [63]. Economic evaluations of adolescent interventions are also lacking hence making it difficult to compare interventions on cost versus benefits [63]. Hence it remains difficult to provide strong evidence for the relative benefits of guideline recommended screening and intervention in clinical settings alone versus other types of intervention for detecting, preventing and reducing adolescents' health risks. Future research is needed to determine more effective methods for assisting clinicians to identify mental health disorder or health compromising behaviour in young people, or for assisting vulnerable young people to self-identify and seek appropriate help. Testing these clinical interventions as part of a multifaceted approach to health risks is also warranted. In addition work remains to review which interventions are most effective to tackle particular health risks in young people as case identification alone is unlikely to help [38, 64].

Limitations

This review has a number of limitations. Firstly, while including uncontrolled studies allowed for a broad overview of research in this area to date, this meant that a meta-analysis was not possible. Another limitation was that as this review investigated studies that combined screening and at least one intervention it is possible that eligible articles that

were not categorised with the theme of 'screening' as a key term in the databases were not picked up in the search.

Conclusions

This systematic review suggests that there is some evidence that the use of screening and intervention with young people for mental health disorder or health compromising behaviours in clinical settings improves health outcomes. Given that young people have expressed a desire and willingness to engage in these discussions and trust clinicians' advice, this review suggests that these discussions should be part of the routine primary care of young people. There is a need for further quality studies, able to overcome the challenges of measuring change in multiple outcomes over time, to strengthen this evidence. Study quality might be enhanced by following young people over time to capture return visits to clinicians and effects of these repeat exposures to screening and intervention on health outcomes, and by conducting a trial alongside wide scale implementation in a population with greater numbers of young people and more study power. Further work might also examine the role of this clinical intervention in multifaceted approaches across health, education and community settings to tackle complex adolescent risky behaviour. This review also highlights a need for research including young adults (18–25 years) and research of screening that includes the identification of protective factors.

Additional file

Additional file 1: Appendix 1. Terms used in the literature search. Terms used in the literature search for each database. (DOCX 17 kb)

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Authors' contributions

MW conducted the systematic review and reviewed the articles, carried out the quality assessment ratings, analysed and interpreted the data, and drafted the manuscript; SK carried out the quality assessment ratings, contributed to the analysis and interpretation of the data, and critically reviewed and modified the manuscript; and, LS, DH and EO contributed to the analysis and interpretation of the data, and critically reviewed and modified the manuscript. All authors have read and approved the final manuscript.

Competing interests

The authors declare that they have no competing interests.

Consent for publication

Not applicable.

Ethics approval and consent to participate

Not applicable.

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4.3 Chapter summary

This chapter presented a systematic review of the literature investigating whether screening and subsequent interventions for mental illness and health-compromising behaviours improve the health outcomes of young people in primary care, answering research question 1 of this thesis. Of the nine articles that met the inclusion criteria, seven studies, including two Randomised Control Trials (RCT) and one clustered RCT, reported positive changes in substance use, diet, sexual health or risky sexual behaviour, alcohol-related risky behaviour, social stress, stress management, helmet use, sleep, and exercise. Thus, I found that there was evidence to suggest that screening of, and subsequent interventions with, young people can lead to improved health outcomes in primary care. A notable finding of the systematic review, supporting the findings of my literature review in Chapter 2, was that there was a paucity of information about the optimal design and implementation requirements of technology-based screening tools in general practice. My next chapter addresses this gap by presenting the findings of a series of co-design workshops I conducted to explore and discuss the design and implementation requirements of a health and lifestyle screening app for young people to use in general practice.

5 Designing a health screening tool to help young people communicate with their general practitioner

5.1 Chapter overview

This chapter presents the second of four papers published from my research. In this paper I present the results of my second study, a series of co-design workshops and interviews with users and stakeholders exploring the design requirements for a technology-based health and lifestyle screening for young people in general practice. The paper was peer reviewed and published in the conference proceedings from the Australian Computer-Human Interaction Conference in December 2015. The chapter concludes with a summary of the key findings related to research question 2 of this thesis.

5.2 PDF of paper

Designing a health screening tool to help young people communicate with their general practitioner

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ABSTRACT

Adolescence is an important developmental period for physical, cognitive, social and emotional development when a wide range of health problems and risky health-related behaviours may emerge and co-occur. General Practitioners (GPs) are ideally positioned to deliver preventive health and early intervention as part of young people's routine health care. A quick and effective way for GPs to identify areas of concern is through technology-based health screening tools, which are acceptable to young people and facilitate self-disclosure about sensitive topics. Despite these advantages, the rate of using this technology remains low. This is the first study that involves all end users and stakeholders in the design of a health screening technology for young people in general practice settings. Our rich findings on the design needs and concerns of young people, GPs, practice staff and parents regarding technologies for health communication will be useful to any researchers and practitioners designing health technologies in a general practice setting.

Author Keywords

Screening, adolescent, participatory design, user-centred design, general practice, health

ACM Classification Keywords

H5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

INTRODUCTION

Adolescence and young adulthood is an important period for physical, cognitive, social and emotional development. During this time, a wide range of mental health issues and health compromising behaviours may emerge and co-occur, and persist into adulthood (Sawyer et al. 2012). For example, the highest incidence of mental health problems occur during adolescence, with one in four young people experiencing a mental health disorder, and 75% of people with mental health disorders experiencing onset by 25 years of age (Kessler et al. 2005). Such disorders typically persist throughout the life

course (Andrad et al. 2000).

Young people may also develop lifestyle habits during adolescence that contribute to the burden of disease into adulthood (Sawyer et al. 2012). Practices such as physical inactivity and unsafe sexual activity are likely to co-occur in young people (Brenner and Collins 1998; Burnett-Zeigler et al. 2012) and have the potential to adversely affect physical and mental health (Spring, Moller, and Coons 2012).

Despite this high prevalence, most young people do not seek help regarding mental health issues and health compromising behaviours (Rickwood, Deane, and Wilson 2007). However, 70-90% of young people visit a general practice or primary care doctor at least once per year, most commonly for physiological reasons (Tylee et al. 2007). This suggests that General Practitioners (GPs) are in a unique position to deliver preventive health and health promotion as part of young people's routine health care, providing early detection and intervention for emerging health concerns. Indeed recent research has found that an intervention where GPs identified and counselled young people with risky behaviours led to a reduction in illicit drug use and fewer unplanned pregnancies (Sanci et al. 2015).

Although general practice has the potential to deliver prevention and promotion, very few young people report that they discuss preventive health issues with their GP. For example, when young people aged 15 to 24 were asked about issues discussed with their GP in the last 12 months, only 3% reported having talked about physical activity, 6% about safe sexual practices and 1% about drinking alcohol (Australian Bureau of Statistics 2013).

There are a number of reasons why young people and GPs may not be discussing these important health issues. GPs report a lack of time to screen multiple health areas (Yarnall et al. 2003) and feel uncomfortable raising sensitive issues that are not the presenting issue (Henry-Reid et al. 2010). Barriers for young people raising issues are embarrassment (Tylee et al. 2007), concern about privacy and confidentiality (Fairbrother et al. 2005) and lack of recognition of having a problem (Haller et al. 2009).

A practical solution to this predicament is the use of health screening tools. These are typically a set of questions completed by a patient that facilitate the quick identification of areas of concern. A major advantage of screening is that it increases the recognition of health problems that may otherwise go undetected (Paul et al. 2014).

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Technology-based health screening tools are designed to be completed by prior to consultation, and are administered via computer or tablet, with results sent immediately to the GP (such as via wireless Internet) in the form of a summary report. These tools enable GPs to normalise sensitive issues, guide discussion about risky behaviour and promote healthy lifestyles (Fothergill et al. 2013).



Figure 1: A technology-based health screening tool, administered by tablet, in a general practice waiting room

An advantage of technology-based screening is that it increases the recognition of health problems because young people are more likely to self-disclose via technology compared with pen and paper (Pappas et al. 2011).

Despite the potential advantages of incorporating technology-based health screening into the regular care of patients, the rate of such screening in general practice remains low in Australia (16%) (McInnes et al., 2006). There is a growing body of research investigating technology adoption in the general practice setting that may explain why adoption is low. It is known that adoption is influenced by a range of inter-related technical, social and organisational factors (Cresswell and Sheikh 2013). Involving all end users in the design stage of technology development may be an effective way for these inter-related factors to be identified and integrated into health technology design and development (Bélanger et al. 2012).

Human Computer Interaction (HCI) provides a framework to involve end users and stakeholders of technology in the design process. Indeed, there is increasing recognition from health researchers about the potential that HCI has to identify, and explore, the acceptance and adoption requirements of health technologies (Poole 2013). For example, user-centred design explores the needs of relevant end users and stakeholders of a technology within the context of use. Additionally, participatory design gives end users and stakeholders greater control and engages them more closely in the design of technology to ensure that it meets their needs and is contextually relevant (Clemensen et al. 2007). In participatory design, knowledge is generated through experiential, generative activities with an emphasis on co-operative learning and design by doing (Hagen et al. 2012). Participatory design has the advantage of providing inclusive and meaningful participation for participants in the research process in a way that other traditional methods of research do not.

Research exploring the design needs of technology-based health screening tools for young people in general practice is very limited. The needs for young people are very unique, so design requirements cannot merely be transposed from other populations on to young people (Fitton and Bell 2014). One study by Whitehouse et al. (2013) described the involvement of young people and health care professionals in the design of a tool, though this was for use in hospital rather than the general practice context (Whitehouse et al. 2013).

There is also a paucity of research that explores the needs of GPs and practice staff regarding screening reports. For instance, it is unclear how tools should be designed to be successfully integrated into existing medical and office technology ecosystems of diverse general practice settings. One study that investigated the implementation of a screening tool for adults visiting GPs found that the attitude of administration and reception staff can be the most significant barrier to adoption (Clark et al. 2009). Thus, it is important to include administrative staff in the design of technologies intended for use in general practice settings.

Another gap concerns the role of parents in the design and use of screening tools by young people. While parents are not primary users, they may still be active participants in their child's healthcare and have the potential to influence whether the tool is used and should be consulted in its design. For instance, parents of young people aged under 18 are typically responsible for making appointments, going to the clinic with their child and speaking on behalf of their child with GPs and reception staff. For these young people, it is parents who may act as gatekeepers for the adoption of a screening tool; thus it is important to consider their needs in the design of the tool.

This is the first study that involves all these relevant users and stakeholders in the design of a health screening technology for young people in general practice settings. Previous research for this audience and setting have not involved all end users in this critical stage of technology development. In the research reported here, the authors used participatory and user-centred techniques with young people, GPs, practice staff and parents to investigate the design requirements for a health screening tool. Our expectation is that these techniques will help ensure acceptability and adoption of screening tools in this setting.

METHOD

A series of workshops was held with representatives of relevant users and stakeholders: young people, GPs and parents of young people. In addition to these workshops, one-on-one face-to-face semi-structured interviews were conducted with general practice staff (receptionists and practice managers). The intention was that design be iterative in nature, in that each workshop incorporated and extended findings from earlier workshops and interviews.

Participants

Participants were recruited via a range of sources. The participant numbers, age and gender for the workshops

and interviews are summarized in Table 1. In addition, GPs reported having worked in general practice for an average of 16 years, ranging from 4 years to 30 years.

Young people were recruited through an advertisement on Facebook, targeting those aged 14 to 25 living in Melbourne. GPs and practice staff were recruited through an advertisement in the newsletter of the Victorian Primary Care Practice-Based Research Network, managed by the Department of General Practice at the University of Melbourne. Parents were recruited through an advertisement in the weekly staff newsletter of the University of Melbourne.

We did not recruit the parents of the young people in our study as this could compromise young people's sense of confidentiality and willingness to be open about their experience of going to the GP.

Participants	Gender: n	Age: n
Young people 14-17 years	Female: 5 Male: 3	14 years: 1 15 years: 3 16 years: 1 17 years: 3
Young people 18-25 years	Female: 6 Male: 2	18 years: 4 19 years: 1 20 years: 1 23 years: 1 25 years: 1
GPs	Female: 4 Male: 4	25-34 years: 1 35-44 years: 3 45-54 years: 2 55-64 years: 2
Practice staff interviews	Female: 11	18-24 years: 2 25-34 years: 4 35-44 years: 1 45-54 years: 4
Parents of young people	Female: 8 Children's ages*: Female: 7 Male: 9	35-44 years: 1 45-54 years: 5 55-66 years: 2 Children's ages*: 15-17 years: 7 18-25 years: 9

*did not attend workshop

Table 1: Number, gender and age of participants, and their children, of workshops and interviews held

Activities

We first held two workshops with young people, one with those aged 14 to 17 and another with those aged 18 to 25. We held separate workshops in case young people at different stages of transitioning into adulthood identified different design needs or concerns. The purpose was to identify their design needs for a technology-based health screening tool. In particular, we were interested in knowing where and when they would like to use the tool, on what device, as well as functional

and content requirements. These workshops were approximately four hours in length.

The first activity in the youth workshops was developing personas to understand the range of motivations and needs of young people in using a tool. Key sections of the persona templates had been partially filled out prior to the workshop. These included age and location, reason for seeing a GP, underlying health concern (different to the presenting condition), and a rating of their self-awareness. This information was based on published adolescent health data (Sawyer et al. 2012). Young people then completed critical design information such as screening location and device. Providing a partially-filled, rather than blank, persona template is unorthodox. However, it enabled sensitive health issues, such as sexually transmitted infections, to be identified in a non-confronting way, while still ensuring there was opportunity to feedback and own the process.

Using the personas they had developed, participants then created storyboards describing how they would like to use the tool in the real-world setting, providing insights into adoption barriers and facilitators. Next, young people created paper-based prototypes to identify design, content and functionality requirements.

A final activity completed by only the 14 to 17 year old group was creating and acting out a role-play in which they imagined recommending the tool to a friend. This helped to identify the potential benefits of using the tool.

During the first workshop the 14 to 17 year old participants stressed that the language in which the tool questions was expressed would be important determiner of acceptability. Thus the 18 to 25 year old group spent time reviewing and rewriting questions for the tool, which were taken from the HEEADDDDS method of interviewing adolescents, a screening tool recommended by the Royal Australian College of General Practitioners. The tool focuses on Home environment, Education and employment, Eating, peer-related Activities, Drugs, Sexuality, Suicide/depression, and Safety from injury and violence (Klein, Goldenring, and Adelman 2014).

We next conducted a workshop with GPs of approximately three hours in length. The aims of this workshop were to identify the requirements for the summary report of the tool and how GPs required it to be integrated into their existing technology use. The workshop activities were paper-based prototyping and systems mapping. Systems mapping is an activity in which participants create a visual map of the different actors, mutual links and flow of information that would interact with the screening tool.

Following the workshop with GPs we conducted a series of semi-structured interviews with receptionists and practice managers, to explore the current technology use of practice staff and their needs in terms of how a technology-based screening tool could be designed to ensure adoption within their workflow. Each interview went for approximately 40 to 60 minutes.

The final workshop was held with parents of young people aged 14 to 25, and was approximately two hours in length. We did not mirror the youth workshops by holding separate workshops for parents of those with children aged 14 to 17 and another for those aged 18 to 25; we felt it likely that some participants would have children in both age groups and might offer useful perspectives.

The purpose of this workshop was to explore how parents would feel about their child using a health screening tool and identify any design features that would facilitate their acceptance of it. The two activities were a brainstorming session, identifying concerns and needs, and a role-play activity, where parents acted out a phone interaction between a parent and receptionist that would facilitate tool acceptance.

Materials collected at the workshops were: audio recordings, paper materials (of group discussion notes, prototypes, storyboards), and photos of whiteboard notes. The first author transcribed the audio recordings and conducted a thematic analysis on all materials to identify patterns or themes within the data (Braun and Clarke 2006). An inductive approach was taken, where themes emerge directly from the data, rather than from a pre-existing coding framework (Patton 2002). Themes were discussed and agreed upon by co-authors who had also attended the workshops. Findings are presented in the following section.

RESULTS

Key findings from workshops and interviews are summarised in Table 2 and described in detail below.

Participatory design workshops with young people

Overall, young people were enthusiastic about the screening tool and believed it would improve their experience of seeing their GP. They identified a number of key benefits to using a tool. One was that it would decrease the awkwardness of raising sensitive issues: "Some problems might be embarrassing [to raise] face-to-face". It would also assist young people to be more independent and take a more active role in their interaction with their GP: "if my mum's there I'll make her speak for me". Another benefit of the tool would be enabling the communication of all relevant information: "the difficulty in actually explaining the problem [verbally to the GP] because you have been waiting for so long and now you only have 5 or 10 minutes to explain [the health issue]...so that is a problem, you're not able to actually express everything". Other benefits identified were that the tool would increase confidence in discussing sensitive issues with their GP and enable them to plan what they would say before the consultation. Finally, the tool could help identify the most salient health issues: "it could tell you what's actually important to tell your doctor".

Privacy and confidentiality

Ensuring the tool had adequate security and privacy functionality was essential to all young people, though it was particularly important to the 14 to 17 year old group: "something the users can know is how the data is going to

be transmitted, is it going to be encrypted". Swapping their phone with friends was common and young people wanted to ensure that any sensitive information was not easily accessible. An acceptable solution proposed by young people was using a dedicated PIN to access the tool, similar to those used by most banking apps.

Workshop	Primary design needs of participants
Young people 14-17 years	- On own device, in own time - Secure and private - Credible logo - Non-judgemental
Young people 18-25 years	- Conversational and engaging language - Simple design, not too much text - Ability to skip and flag items
GPs	- Report to flag high risk issues at top, and recommend next steps and referrals - Minimise medico-legal risk
Practice staff interviews	- Adaptable to their existing work practices and technology use - Minimise additional work
Parents of young people	- Range of comfort level of child discussing issues alone with GP - Must trust in the GP to follow up - Want to view the questions

Table 2: Primary design needs of participants of workshops and interviews held

It was also important for young people to feel reassured about confidentiality in order to feel comfortable to be honest in responding: "just so people can be like 'oh ok' and not be worried that they're going to call the cops if I say I do hard-arse drugs every day".

Layout

As shown in the prototype drawn by young people in Figure 2, young people liked the use of icons, and minimal text, to aid navigation: "you don't want to be reading through heaps of text." They also recommended that the tool start with questions on less sensitive health issues: "You've got to work your way to this area [more sensitive questions], [so starting with] something like diet sleep, family medical history, mental/emotional state, drugs, sexual activity, so it's like you've been warmed up a bit."

Content

Young people wanted questions and responses to reflect the complexity of their lives and the different contexts they experienced. An example raised was that a young person might be feeling depressed, not due to ongoing

clinical illness, but rather as a normal and temporary reaction to other events in their life, such as a death in the family. A major concern for young people was the possibility of being *judged* by the GPs based on their responses; “don’t want to be labelled”. Rather than yes/no responses that are “just too definite”, young people wanted the option of rating concerns on a scale. Being able to both skip or elaborate on items was important to young people.

Look and feel

Young people felt it was important for the tool to be designed in such a way that suggested credibility and legitimacy. As shown in Figure 3, they suggested that adding a government or university logo on the splash screen would be a “logo of integrity”. Young people preferred a “clean, simplistic, minimal aesthetic...not cluttered with information”.

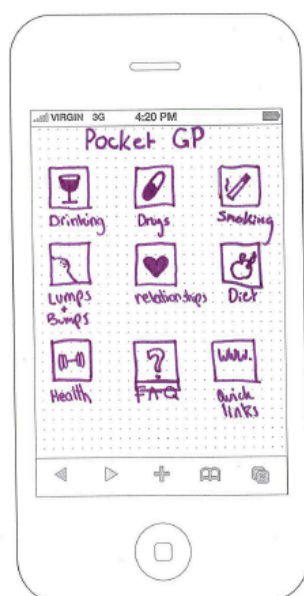


Figure 2: Prototype from young people of screening tool main menu

Conversely, young people also did not want the tool to be “too clinical”, and wanted it to have a conversational and engaging tone. Ways to do this included personalised greetings, the use of “more colourful...or soft colours or greys instead of black and white, really harsh colours”, introductory text that outlined the benefits and might motivate them to use it. Said one participant: “it should be really fun to use and have some greetings, like says hello to you and goodbye to you and ‘have a nice day’”.

No automated advice

Young people were adamant that they did not want any automated advice on the tool. We proposed a feature to provide tailored tips, information or links to existing evidence-based online self-help interventions based on young people’s responses that could be viewed and used prior to the consultation. However young people felt that advice would have more credibility if it was received directly from the GP: “the thing with getting tips and all that is that sometimes if you hear it from someone you

take it in more because it seems like the person is more interested in you but if you read it on the app you just skim over it...it would be more beneficial [from GPs]”. If any additional advice was included, young people felt it was important that they were optional features: at the “bottom of [the] page – there if you need it.”

While young people stressed the tool’s content and design “just needs to be simple” they also suggested a range of other features for future versions of the tool. These included the ability to share their results with other health professionals (such as psychologists), being able to complete the screen again and track results over time, a GPS functionality that showed bulk billing GPs in their area, reminders for things such as pap smears, and the ability to receive prescriptions, information about medications, medical certificates and referrals from the GP.



Figure 3: Prototype from young people of screening tool splash screen

Platform and location

Young people expressed a preference to complete the screening tool on their own computer or mobile device. Completing the tool on their smartphone was the most popular option. Young people felt it was important that the tool be usable on both Android and Apple platforms, as both are widely used by their peer group. Their preference was to be sent a link to download the tool at the time of making the appointment with their GP and to complete the tool in their own time before attending the practice. However they also wanted the option of completing the tool in the waiting room immediately before the consultation: “it’s convenient to have more options than one, so to have it on your own phone it would be simple to do it in your own time”.

Participatory design workshop with GPs

GPs spent some time discussing the advantages and disadvantages of conducting screening via technology versus face-to-face. In particular, GPs expressed concern that “there’s no body language in an app, the space is really not your personal space and all of those things

[that] contribute to getting a full picture and gathering information". On the other hand, there was also recognition that a technology screen could increase self-disclosure: "it's a different way of getting information out of them that might be a little bit more comfortable to them...[it is] a tool to open up conversation".

Medico-legal concerns

GPs understood and accepted that young people would prefer to use the tool prior to physically being at the clinic, admitting "there is no private place in our waiting room". However, they also identified this scenario as presenting significant medico-legal and ethical risk for them as medical practitioners. If a young person's responses indicate a high risk of harming themselves or someone else, GPs have a legal duty of care to intervene right away. If responses were automatically available to GPs as soon as young people completed the tool this could be problematic if completed outside business hours, when GPs would not be checking the results. Likewise, if the young person "disclose[s] something terrible and then they decide not to come, how do we follow it up?" This presented a critical design issue and participants suggested creating some sort of technical solution to prevent responses being available to them until the young person physically arrived in the clinic, when they could then read the summary report immediately before the consultation.

Summary report

In terms of design, GPs wanted a summary report that was brief and highlighted areas of high risk at the top of their screen, so it could be quickly scanned. They also preferred that a summary not include fields that required them to input a lot of text. They wanted the summary to include a brief outline of suggested next steps and referrals based on areas of concern.

GPs were mindful of the needs of young people and how to best use the results. They felt that although classifying issues as 'high risk' to 'low risk' in their report would be helpful for GPs, using these terms with young people could be inappropriate and perceived as judgmental. GPs also liked the idea of young people using the tool regularly and being able to track the results over time in the summary report.

Software compatibility

GPs preferred to have summary results automatically integrated within their existing medical software and client files. However, they recognised that this may not be possible, given the number of different software programs currently used in Australian general practices (e.g. Zedmed and Medical Director). If integration was not possible, GPs wanted reports from the screening tool to be saved as an attachment in the patient files of the clinical software. While not ideal, they felt this would have an advantage over emailed results, as email accounts are not necessarily regularly checked, and over being added into other electronically received results that they already feel are burdensome.

Interviews with practice staff

Current technology use

Practice staff reported that all clinics used medical communicate within the office using instant messaging bookings, but only in addition to traditional phone software that allows reception to track appointments and internal email. A few clinics had introduced online to bookings. Most clinics routinely used SMS, built into the medical software, to efficiently and effectively remind patients of upcoming appointments. Practice staff reported that they are not required to triage incoming electronic results (e.g. blood results) as these are automatically downloaded and kept in an electronic holding pen for GPs to check and file.

Overall, technology use by practice staff in their roles was minimal. All still used paper-based forms to collect information for new clients. Apart from this, none required patients to fill in any paper or electronic pre-consultation screening or questionnaires.

Implementation considerations

Like GPs, practice staff preferred that the tool be fully integrated into existing medical software: "somehow it goes into our software package...much like a[n electronically received] result I suppose, that would be the easiest because the doctors won't want to be searching for it in all different areas." However, they all reported that they are also used to dealing with external information, predominantly paper-based referrals and letters which are scanned and uploaded to the patient's electronic file.

Barriers to use

Practice staff identified a number of potential barriers to the introduction of a screening tool into their clinic. A major barrier was lack of time to manage the tool; reception staff are generally too busy answering phones and attending to patients in the waiting room to be able to do much else: "it's so busy, so full on". A tool that required reception staff to register a new user on a dedicated website (e.g. to open the software, create a new profile and enter details at the time of appointment) was seen as unrealistic. Staff also felt it unlikely that they would have time to open a dedicated website to check whether arriving young people had already completed.

Practice staff were very interested in the potential of technology but only if it could take pressure off reception. Some believed requiring young people to use the tool in the waiting room on a practice-owned tablet would be the best option, given staff have the routine of handing out paper forms to new patient clients: "it would be a lot easier for them... because sometimes the phones don't stop ringing and they don't have much time".

Others felt a link to the tool could be sent to patients using their SMS software and incorporated into their daily routine of messaging patients: "everyone's mobile number is on our system so if you could create a little way that once we attend the patient or make an appointment for the patient, somehow it triggers off that this letter, as well as the link, is sent to their mobile and it's as easy as the receptionist pressing a button in Zedmed or their software and sending it off."

Participatory design workshop with parents

Factors affecting acceptance

Parents identified a number of factors that would encourage their acceptance of their child using the tool. Having a sense of trust and confidence in the GP was important, as was having an understanding of how the responses would be followed up: “You want some confidence that the doctor is going to look at the information, read it properly, and be sensitive with how they bring up whatever issues come out of it”.

Other factors included being informed of the tool’s purpose, the privacy and security of their child’s responses, how often the child would use it, and how health issues would be followed up. Parents also suggested the tool had the potential to facilitate their relationship between themselves and their child: “something to bring them together”.

Confidentiality of child-doctor relationship

The extent to which parents were comfortable with their child discussing health issues alone with the GP varied, depending on the particular health issue being discussed. Most parents were comfortable with their child talking alone about issues such as physical illness, exercise and diet. However, there was less agreement on more sensitive issues such as sexual health, mental health, and drugs and alcohol. A number of participants were very comfortable with their child talking about sexually transmitted infections, while others were “very uncomfortable”.

Some parents wanted to be able to view their child’s responses to the tool, while others did not. Others suggested a compromise: a “graded response generated to parents without specific information, i.e. 1=no need to worry, 5=high needs but team is managing”, although there was a recognition that this general rating could result in anxiety and a sense of helplessness for parents. All felt they would like to see a copy of the questions, so that they knew at least what their child was being asked to discuss.

DISCUSSION

This study aimed to involve all end users and stakeholders in exploring the design needs of a health screening technology for young people in general practice. We held a series of participatory and user-centred design workshops and interviews with representatives of relevant users and stakeholders: young people, GPs, practice staff and parents of young people.

Tensions in stakeholder needs

There was agreement between all groups in terms of the tool’s potential to facilitate communication and disclosure for young people with GPs. However, each group had unique requirements impacting tool acceptability and adoption, with results indicating two major tensions in stakeholder needs: method of access, and content.

“Method of access” refers to when young people and GPs would use the tool. Young people reported a preference to download and complete the screening tool on their own device in their own time. This finding is in contrast to previous studies that have developed screening tools for

young people on tablet or computer for use in the waiting room, immediately prior to consultation. This suggests that, unlike the traditional paradigm by which healthcare takes place at a designated time in a dedicated clinical setting, young people want to be in control of when and where they engage with the tool. This preference may be a reflection of the emergence of online health services and the proliferation of commercial health apps where help and information is available 24/7. Interestingly, a number of small studies with adults have found that completing a technology-based health screening tool at home before their consultation is also an acceptable and feasible option for this population (Postel-Vinay et al. 2014; Slack et al. 2012).

Downloading the tool to their own device would provide young people with a sense of ownership of their own health data, in a way that they do not currently enjoy with their GP or the larger health system. It would also enable young people to complete the screening tool in a private and safe environment, which are conditions that encourage greater self-disclosure and more accurate responses (Wissow et al. 2013).

This desire to use the tool on their own device in their own time presented a challenge for GPs, who did not want to have access to young people’s responses if they were sent when GPs were not at work, when they would not be able to review the summary report and follow up high risk issues in a timely manner. One advantage of technology-based screening tools has been that they provide practitioners with immediate results, with none of the data-entry required for paper-based tools. However, previous research has used technology-based screening tools in the waiting room before the consultation (Olson et al. 2009; Forjuoh et al. 2014). This change in context of when and where the tool is used by young people turns an advantage into a disadvantage for GPs, who are also a key user group of the tool. Thus, it is important to understand how a requirement from one user group may have unintended consequences on another user group.

The contrast in the needs of young people and GPs is striking, reflecting the current wider health policy context in Australia. A key finding of the recently released National Review of Mental Health Programs and Services was that the health system has been driven by service providers rather than the needs of patients. It recommends designing services to be more patient-centred, where the focus is on the needs of patients and their families, rather than only on the needs of the provider (National Mental Health Commission 2014). Our findings provide an understanding of how a health technology can be designed to meet the needs of all users and stakeholders.

The second major tension was around the depth of health information that young people wanted to provide compared to that which the GPs wanted to receive. Young people wanted to convey the complexity and context of their lives to the GP. In contrast, GPs did not want this detail, preferring a brief and easy-to-scan summary. A solution might include a summary that displays a quick overview of key questions, while providing the option to view responses in more detail. It

may also be useful for both young people and GPs the tool to include a statement.

As well as these two main tensions, there were a number of other interesting findings. An unexpected outcome from young people was that they did not want to have additional online interventions or information incorporated into the tool. There are a number of factors that may explain this result. It may be that young participants did not see the value of these features because they did not have health issues or, if they did, were not ready to change how they accessed information. Another explanation is that young people do not want automated responses because they are flooded with impersonal information online and they want a qualified person they trust to discuss issues with them personally.

Another interesting finding from young people was that they wanted a tool that feels both being official and informal and did not see these requirements as contradictory. Previously there may have been a tendency for online information from government health websites to be perceived as credible but boring. There is perhaps now an expectation from young people that to be acceptable all online information, regardless of the source, needs to be both engaging and informative.

Unlike young people, parents are not the main users of the technology. However, they do have the right and ability to influence the design and rollout of a tool their children will use. This is particularly the case for those with children aged under 18, in whose healthcare parents often take a more active role. A key facilitator for the acceptability of the tool identified by parents was ensuring they had trust in the GP. At a minimum, parents wanted to know which questions would be asked of their child, and receive reassurance that any issues would be followed up appropriately. Indeed research suggests that parents' views about confidentiality are complex and conflicting (Duncan et al. 2011), and that building trust in the GPs is an important way to build parental confidence in confidential health care for their children (Sasse et al. 2013).

The findings from interviews with practice staff also suggest a user group with unique needs. Practice staff suggested ways they might integrate a technology-based screening tool into their work context. For example, some would use their clinical software to send an SMS link to young people for the tool at the time of the appointment, while others would hand out a practice-owned tablet in the waiting room. This suggests that any technology developed for the general practice context needs to be flexible in order to be successfully adapted and adopted into diverse work practices and, ideally, make practice staff's role easier.

Finally, a surprising insight from the parents' workshop was the potential for their child's use of the tool as being something that would bring parents and children together. Understandably, parents wanted to continue to play a role in their child's healthcare, even while recognising young people's growing need for privacy and independence. Interestingly, recent research found that young people

also view technology as a potential 'meeting ground' with their parents, where time and experiences can be shared (Borca et al. 2015). Further research is needed to explore how this shared online experience may be extended to the healthcare context.

Limitations

Our research aimed to recruit participants who represented the diversity of end users and stakeholders of a technology-based screening tool in general practice: young people, GPs, parents and practice staff. While we achieved a reasonable spread of participants in terms of age range for each group, no males volunteered to participate in the parent or practice staff groups. For parents, this may be because mothers are usually responsible for taking their children to the GP. For practice staff, this may simply reflect the trend that the majority of reception and practice staff are female. Another limitation is that participants other than young people were recruited through the University of Melbourne, so that workshop participants may not have been representative of the general population. Thus, due to these recruitment and participation factors, the generalisability of our findings may be limited.

Future research

This study provides new insights into requirements for the design of health screening technology for young people attending general practice. We plan to conduct future research by building a tool informed by these results to be evaluated in real world settings. This will provide an opportunity to investigate the experience of using the tool, how it affects the relationship between young people and GPs, and whether its use can be sustained in the general practice context.

CONCLUSION

Our findings will be useful to researchers and practitioners designing health technologies in the general practice setting. Our findings regarding the impact of young people's needs on adoption by practice staff and GPs are relevant for those seeking to design new technology for the general practice context. Further, our findings that parents differ in how they want to engage with the tool, and that trust in the GP plays a central role in acceptability, illustrate the complex factors surrounding the design and use of health technologies for young people transitioning into adulthood. However the enthusiasm for a health screening tool by our young participants suggests that if the above concerns can be addressed, a screening tool is likely to be adopted by them.

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5.3 Chapter summary

This chapter presented the results of my secondary study, exploring the design needs and concerns of young people, GPs, practice staff, and parents for the implementation of a health and lifestyle technology-based tool. The findings highlighted the unique and sometimes conflicting design, content and usage requirements between user and stakeholder groups. Young people wanted a tool that they could complete on their own device and in their own time, while the GPs preferred the tool to be completed prior to the consultation, to ensure GPs follow up any high-risk responses in a timely manner. In addition, young people wanted a screening tool to allow them to convey the complexity and depth of the issues they are experiencing, which was in contrast to GPs who expressed a preference for a brief summary in the summary report. I also found that the technology-based screening tool would need to be flexible to accommodate diverse work practices. The findings in this study were used to build a technology-based screening tool and then investigate its use and implementation in the real-world general practice setting, which I report in the next two chapters.

6 Improving patient-centred care for young people in general practice with the co-designed screening app: Mixed methods study

6.1 Chapter overview

The findings from the co-design workshops presented in the previous chapter were used to directly inform the development of a mobile-based health and lifestyle screening app ('Check Up GP'). Chapter 6 presents the findings of Study 3a, a mixed-methods study of whether using Check Up GP affected young people's assessment of care and disclosure when attending general practice as part of routine care. For this study, I compared exit surveys of 30 young people in a one-month treatment-as-usual phase with 85 young people in a two-month intervention phase, where young people completed Check Up GP prior to attending the clinic as part of their routine care. I followed this up with semi-structured interviews with 14 young people from the intervention group. The findings are presented in a paper that was peer reviewed and published in *JMIR mHealth and uHealth* in August 2017. The chapter concludes with a summary of the key findings related to research question 3 of this thesis, which was addressed in this study.

6.2 PDF of paper

Original Paper

Improving Patient-Centered Care for Young People in General Practice With a Codesigned Screening App: Mixed Methods Study

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Abstract

Background: Despite experiencing a high prevalence and co-occurrence of mental health disorders and health-compromising behaviors, young people tend not to seek professional help for these concerns. However, they do regularly attend primary care, making primary care providers ideally situated to identify and discuss mental health and lifestyle issues as part of young people's routine health care.

Objective: The aim was to investigate whether using a codesigned health and lifestyle-screening app, Check Up GP, in general practice influenced young people's assessment of the quality of their care (measures of patient-centered care and youth friendliness), and their disclosure of sensitive issues. In addition, this study aimed to explore young people's acceptance and experience of using a screening app during regular health care.

Methods: This was a mixed methods implementation study of Check Up GP with young people aged 14 to 25 years attending a general practice clinic in urban Melbourne, Australia. A 1-month treatment-as-usual group was compared to a 2-month intervention group in which young people and their general practitioners (GPs) used Check Up GP. Young people in both groups completed an exit survey immediately after their consultation about disclosure, patient-centered and youth-friendly care, and judgment. In addition, participants in the intervention group were surveyed about app acceptability and usability and their willingness to use it again. Semistructured interviews with participants in the intervention group expanded on themes covered in the survey.

Results: The exit survey was completed by 30 young people in the treatment-as-usual group and 85 young people in the intervention group. Young people using Check Up GP reported greater disclosure of health issues ($P<.001$), and rated their GP higher in patient-centered care: communication and partnership ($P=.01$), personal relationship ($P=.01$), health promotion ($P=.03$), and interest in effect on life ($P<.001$). No differences were found on core indicators of youth-friendly care: trust, level of comfort, expectations met, and time to ask questions. In all, 86% (73/85) of young people felt the app was a "good idea" and only 1% (1/85) thought it a "bad idea." Thematic analysis of qualitative interviews with 14 participants found that Check Up GP created scope to address unmet health needs and increased sense of preparedness, with use moderated by honesty, motivation, app content and functionality, and app administration.

Conclusions: Integrating a health and lifestyle-screening app into face-to-face care can enrich young people's experience of seeing their GP, create scope to identify and address unmet health needs, and increase patient-centered care. Further research is needed to investigate the effect of using a health and lifestyle-screening app in a diverse range of clinic types and settings, and with a diverse range of GPs and youth.

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KEYWORDS

adolescent; needs assessment; general practice; primary prevention; health behavior; health information technology; patient-centered care

Introduction

Adolescence and young adulthood are periods of major transition in physical, cognitive, social, and emotional development along the journey from childhood to adulthood [1]. These are also periods when mental health disorders and health-compromising behaviors emerge [1]. Worldwide, substance use, poor diet, lack of exercise, and mental health disorders are the leading risk factors for years lost due to ill health, disability, or early death for young people [2]. These disorders and behaviors tend to co-occur [3,4] and persist into adulthood [5-7].

Despite experiencing a high prevalence and co-occurrence of mental health disorders and lifestyle issues, young people do not usually seek professional help for these concerns [8]. Yet, they do regularly attend primary care, usually to address physiological concerns [9,10], making primary care providers (PCPs) ideally situated to opportunistically discuss mental health and lifestyle issues, and to provide health promotion and early intervention as needed. Both young people and PCPs report wanting to have these discussions [11,12], yet seldom do so [10,12,13], even during well-child visits in the United States, which are appointments dedicated to screening for health and lifestyle issues and providing preventive health care [14].

Patient-centered care is a theoretical concept proposing that for therapeutic benefits patients need to be actively engaged in their care, with a focus on communication, partnership, and health promotion in the doctor-patient consultation [15]. Patient-centered care has been associated with improved symptom burden, satisfaction, and enablement [16]. Although there is limited research in youth populations, evidence suggests that young people prefer a patient-centered approach, and taking an active partnership role in decision making over a more passive role [17]. Despite this, many young people do not receive patient-centered care, even though it is associated with higher ratings of quality care [18].

Similar to patient-centered care, youth-friendly care is an evidence-based theoretical framework for delivering quality health care. However, youth-friendly care looks specifically at the indicators of quality service delivery for adolescents and young adults. Ambresin et al [19] have developed a theoretical framework for youth-friendly care at both the clinic and individual level: accessibility of health care, staff attitude (trustworthy, supportive, respectful), communication, medical competency, evidence-based guideline-driven care (confidentiality, comprehensive care), age-appropriate environment (privacy, teen-orientated health information), involvement in health care, and health outcomes. Thus, the patient-centered and youth-friendly care theoretical frameworks can provide the foundations for designing and evaluating technological interventions designed to improve young people's engagement with health care.

Regular screening of young people for a range of health and lifestyle issues is recommended by peak professional bodies

[20,21] and, along with subsequent intervention, may improve health outcomes [22]. It is known that screening via technology increases disclosure when compared with paper [23,24] and face-to-face [25,26] formats. Furthermore, young people prefer initially disclosing health information via technology rather than face-to-face, even when they know the results will be reviewed by their practitioner [27,28]. Previous studies have validated technology-based health and lifestyle-screening tools for young people [29,30].

Evidence in non-youth populations suggests that technology-based screening improves patient-centered care [31,32]; however, evidence is limited for the impact on young people's patient-centered and youth-friendly care. One study by Gadowski et al [33] undertook an analysis of audiotaped consultations and found that technology-based screening tool use increased doctor engagement and discussion of psychosocial and mental issues, without affecting partnership or rapport. However, this study did not interview young people about their experience of care. Another study by Olson et al [34] found that young people using a technology-based screening tool were more likely to feel that they were listened to carefully, that the discussion was confidential, and to feel more satisfied. Other core elements of youth-friendly care, such as trust and respect, and key elements of patient-centered care, such as health prevention and promotion and shared power, remain unexplored. Both the studies of Gadowski et al and Olson et al were limited to young people aged 19 years or younger and attending well-child visits [33,34]. More evidence is needed about the use of technology-based screening during other occasions of care because less than 50% of young people attend well-child consultations [35,36]; therefore, most are not receiving preventive care. Further, young adults aged 18 to 25 years have a higher prevalence of significant health risks, such as sexually transmitted infections, substance use, and mental health problems [37], and have more unmet health needs [38] compared to younger adolescents. Hence, testing of the utility of technology-based screening is also required in this group.

Guidelines recommend annual preventive screening [20,21]; however, there is a paucity of research on whether young people are willing to use technology-based screening tools on a regular basis and, if so, how often. Although one study in a hospital-based adolescent and young adult clinic found that 84% of young people would be willing to complete a screening tool once a year, participants responded before their consultation [39]. It is possible their responses might be different after the experience of using the tool with their practitioner and at a practice not servicing only youth.

The aim of this study was to investigate how using a codesigned health and lifestyle-screening app, Check Up GP, based on the theoretical principles of patient-centered and youth-friendly care, in an Australian general practice influenced young people's assessment of care and their engagement through disclosure of sensitive issues. We were also interested in understanding young

people's acceptance and experience of using a screening app as part of their regular health care.

This study addresses several aspects of the evidence gap by first conducting an in-depth mixed methods analysis of young people's experience of using a technology-based screening tool incorporated opportunistically into routine health care visits rather than well visits, and second, by including young people aged 14 to 25 years in the study. Furthermore, Australian general practice, although being the most commonly accessed form of primary health care by Australian youth, caters for the population across the life span rather than being a youth-specific service, hence this study also provides evidence relevant to generalist health care settings.

Methods

Study Design and Setting

We conducted a mixed methods implementation study in 2016, comparing a 1-month treatment-as-usual (TAU) phase with a 2-month intervention phase. In the intervention phase, Check Up GP was integrated into the routine care of young people attending a general practice. The length of the study was decided by mutual agreement between the clinic and researchers prior to the commencement. Ethics approval was obtained from the University of Melbourne (Ethics ID #1544281).

One general practice clinic was recruited through the Victorian Primary Care Practice-Based Research Network, managed by the Department of General Practice at the University of Melbourne. The clinic is a large general practitioner (GP)-owned and operated practice located in an area of relative socioeconomic advantage in urban Melbourne, Australia, staffed by 12 GPs, a practice manager, a reception coordinator, and eight receptionists. Open 365 days a year, the practice is funded by a patient copayment on top of the national health care basic amount.

Participants

The four GP principal owners of the practice participated in the study, along with their patients aged 14 to 25 years attending for routine primary care during the study period. Patients were excluded from the study if their GP assessed that their patient was very unwell (eg, vomiting, weak, psychotic), unable to read/speak English, or if they were younger than 18 years of age and not a mature minor [40]. The practice support staff, being the practice manager, reception coordinator, and all eight receptionists, also participated. The practice support staff were responsible for administering Check Up GP to young people.

Check Up GP App and Codesign Process

Based on the design needs identified in codesign workshops held with young people, GPs, practice support staff, and parents (reported previously [41]), we contracted a commercial software

developer to build the health and lifestyle-screening tool, Check Up GP. To continue the codesign process, we recruited two reference groups representing the main end users of the tool; one of young people aged 14 to 25 years and another of GPs. These reference groups provided feedback and guidance on the design, content, and implementation of Check Up GP to ensure the final product reflected the requirements identified in the original codesign workshops. This process was also directly guided by the two theoretical frameworks, with each component of patient-centered care and youth-friendly care (described previously) being incorporated into Check Up GP. The resulting key technology and design features of Check Up GP are mapped onto each component of patient-centered care and youth-friendly care theoretical frameworks in Table 1.

Check Up GP consisted of two components: the questionnaire that patients answered and the summary report for GPs. The questionnaire was adapted from the HEEADSSS (Home environment, Education and employment, Eating, peer-related Activities, Drugs, Sexuality, Suicide and depression, Safety from injury and violence) preventive health framework for interviewing adolescents [42,43] recommended by the Royal Australian College of General Practitioners [21]. The framework covers the range of health, social, psychological, and physiological issues and behaviors contributing to the major burdens of disease for young people and suggests that they be raised and explored with young patients. We included validated screening tools in many of the HEEADSSS domains: eating disorders (SCOFF Questionnaire) [44], anxiety (Generalized Anxiety Disorder-2 [GAD-2]) [45], depression (Patient Health Questionnaire-2 [PHQ-2]) [46], and drugs and alcohol (CRAFT screening test) [47]. At the beginning of the app, we included information about the research study and the purpose of the app, supplemented by a short video. Youth responses to the questions in the app in the format of a clinician summary report were immediately available to the GP via a secure website. The summary highlighted areas of concern, and strengths, along with tips on youth-friendly consultations and suggested actions to take on areas of concern including referral options, information, and resources. Screenshots of the youth and GP interfaces are included in Multimedia Appendix 1.

Study Procedure and Measures

The study had three main phases: a TAU phase that consisted of a GP profile survey conducted at the start of data collection on GPs self-perceived ratings of consulting and communicating with youth, and youth "exit surveys" conducted at the practice of young people postconsultation with their GP; an intervention phase, that involved exit surveys of young people postconsultation after Check Up GP had been implemented; and a postintervention phase employing semistructured interviews with young people. The measures and procedure for each phase are described subsequently and summarized in Table 2.

Table 1. Key technology and design features of Check Up GP according to codesign workshop requirements and theoretical framework components.

Young people's identified requirements	Theoretical framework (component) ^a	GPs' identified requirements ^a	Theoretical framework (component) ^a
Link to Check Up GP sent via SMS at time of making the appointment	YFC (age-appropriate, accessibility)	Secure server	YFC (guideline-driven: confidentiality)
Secure log in	YFC (guideline-driven: confidentiality, accessibility)	Areas of concern/strengths displayed via traffic-light system from low risk (green) through to moderate (yellow) and high risk (red)	YFC (guideline-driven care), PCC (partnership, communication)
Choice of whether to complete on own device prior to attending appointment or on tablet in clinic waiting room immediately prior to appointment	YFC (age-appropriate; accessibility)	High level summary, with ability to expand for more detail	PCC (partnership, communication)
Youth-friendly language, design	YFC (age-appropriate, communication), PCC (communication)	Tips on youth-friendly practice including communication skills, negotiating a management plan	YFC (guideline-driven care, involvement in health care, communication, staff attitude), PCC (partnership, communication)
Ability to skip questions and flag issues for discussion	YFC (involvement in health care), PCC (partnership)	Suggested evidence-based/recommended for actions and health promotion, referrals to appropriate services and self-help apps	YFC (medical competency, guideline-driven, health outcomes), PCC (health promotion, partnership, communication)
		Ability to save as PDF for export to electronic health record	YFC (medical competency, guideline-driven)

^aPCC: patient-centered care theoretical framework; PDF: portable document format; YFC: youth-friendly care theoretical framework.

Phase 1: Treatment As Usual

The GPs completed a brief paper-based profile survey of demographic information and self-rated their enthusiasm, knowledge, and confidence in consulting and communicating with youth. We then collected exit interviews from young people attending the clinic. During this phase, researchers approached young patients in the waiting room when they arrived and, if they were seeing a participating GP and aged 14 to 25 years, the researcher provided them with information about the study and invited them to participate. If they agreed to participate, the young patient was asked to take a form into their consultation for their GP to assess their eligibility to participate in the study. The patient handed the form back to the researcher on returning to the waiting room. After their consultation, each participant completed the short exit survey on a tablet in the waiting room, with consent provided at the start of the survey. As described in Table 2, this survey asked young people to self-rate levels of disclosure and to rate patient-centered and youth-friendly care and perceived judgment from their GP.

Phase 2: Intervention

Following the TAU phase, clinic staff were introduced to the Check Up GP app. The GPs and practice support staff were trained in administering and using Check Up GP. This included showing a short video, which demonstrated how to administer and integrate the tool into the consultation with young people. We then met individually with each GP to ensure that they could easily access the online clinician summary on their computer and felt comfortable using it. At this time, two training points were stressed: (1) the importance of acknowledging all issues raised and, if time was not available to address them, to then organize a follow-up consultation and (2) to ask for time alone when discussing personal or sensitive issues if a parent was attending with the young person. These practice points were also available to GPs in the clinician interface of the app. We worked closely with GPs and practice support staff throughout the intervention phase to refine the app and its administration in rapid cycles of continuous quality improvement [51].

Table 2. Measures used in the treatment-as-usual (TAU), intervention, and postintervention phase.

Name of measure	Type, source, and content of measure	Method and phase of administration
GP measures		
GP profile survey	Demographic information survey; age, gender, previous training in youth health	Paper questionnaire, TAU
Knowledge and confidence	Self-rated Likert scales (from 1=not at all to 7=extremely) from Sanci et al [48]; how knowledgeable and confident in consulting with young people aged 14-17, consulting with young people aged 18-25, consulting with male young people, consulting with female young people, communicating with young people, and exploring issues beyond the presenting problem	Paper questionnaire, TAU
Enthusiasm	Self-rated Likert scale (from 1=very unenthusiastic to 11=very enthusiastic) from Sanci et al [48]; enthusiasm for seeing young people	Paper questionnaire, TAU
Young people's measures (completed post consultation)		
Disclosure	Self-rated Likert scales (from 1=no disclosure to 5=full disclosure, or not applicable) adapted ^a from Bradford and Rickwood [25]; disclosure about home life, school/work, bullying/harassment, alcohol and drug use, sexual health and sexuality, safety, mood, addiction, stressful events, diet, exercise, sleep patterns, and risky behavior	Tablet questionnaire, TAU and intervention
Patient-centered care	Self-rated Likert scales (from 1=very strongly agree to 7=very strongly disagree), validated tool by Little et al [16]; a 21-item validated tool consisting of 5 components of patient-centered care: communication and partnership, personal relationship, health promotion, positive approach to diagnosis and prognosis, and interest in the effect on life	Tablet questionnaire, TAU and intervention
Youth-friendly care	Self-rated Likert scales, selected items from tool ^b by Haller et al [49]; trust in the GP (from 1=poor to 5=excellent), whether expectations were met (from 1=strongly disagree to 4=strongly agree), whether there was enough time to ask questions (from 1=strongly disagree to 4=strongly agree), and level of comfort with GP (from 1=not at all to 5=very comfortable)	Tablet questionnaire, TAU and intervention
Fear of judgment	Self-rated Likert scales (from 1=not at all concerned to 5=very concerned) adapted ^c from Bradford and Rickwood [25]; how worried young people were that the GP would think they were a bad person if they talked about everything they had been thinking, feeling, and doing; the GP would think there was something really wrong with them; they would learn things about themselves they didn't want to know; they would lose control of their emotions; and that the GP would judge them	Tablet questionnaire, TAU and intervention
App acceptability	Self-rated Likert scales (from 1=not at all to 5=very much) from Bradford and Rickwood [25]; confidence of Check Up GP providing an accurate picture, comfort in disclosing personal information through Check Up GP, whether questions were difficult to understand, whether questions caused upset, and whether GP addressed issues raised	Tablet questionnaire, intervention
App usability	Self-rated Likert scales selected items from validated tool by Stoyanov et al [50]; how easy Check Up GP was to learn (from 1=very hard to 5=able to use immediately) and how good Check Up GP looked (from 1=no visual appeal to 5=very attractive)	Tablet questionnaire, intervention
Overall opinion and willingness to use again	Self-rated categorical responses; opinion of using Check Up GP (good idea, bad idea, don't know), whether willing to use again (yes, no, and, if so, how often)	Tablet questionnaire, intervention
Youth interview	Semistructured interview; experience of using Check Up GP, how it was administrated and integrated into routine care, if they would like to use again in the future	Phone interview, audiotaped, postintervention

^aAdaption was replacing "therapist" with "doctor" and "I lied or misrepresented myself" with a "not applicable" option.

^bEnglish version of tool validated in Bosnian language.

^cAdaption was replacing "therapist" with "doctor."

Receptionists informed young people or parents about Check Up GP when they called the clinic to make an appointment. Receptionists then flagged the appointment in the clinical software so the reception coordinator would send the patient a short message service (SMS) text message containing the tool link. Patients could choose to complete Check Up GP before they arrived at the clinic or in the waiting room just prior to their appointment. When young patients arrived at the clinic, receptionists asked those aged 14 to 25 years who were patients of participating GPs if they had received the SMS text message

and completed the app. Patients who had not completed the app were handed a tablet to complete it in the waiting room before their consultation. The receptionist made a note in the clinical software reminding the GP to review the young person's responses prior to calling them into the consultation.

During the intervention phase, researchers approached young people in the waiting room to participate in the study and complete an exit survey postconsultation, in the same manner as in the TAU phase. This exit survey had the same questions as those in the TAU phase, with additional items related to

Check Up GP as described in Table 2: acceptability, usability, overall opinion, and willingness to use again in the future.

Phase 3: Postintervention

At the end of the exit survey, participants were invited to participate in a follow-up postintervention interview held within 2 weeks of their consultation at a mutually agreed time. The interview guide was informed in part by the themes emerging from the codesign workshops [41]. The aim of these interviews was to explore young people's experience of using Check Up GP, including how it affected the consultation and their relationship with their GP, and whether they would like to use the app again in the future.

Reimbursement

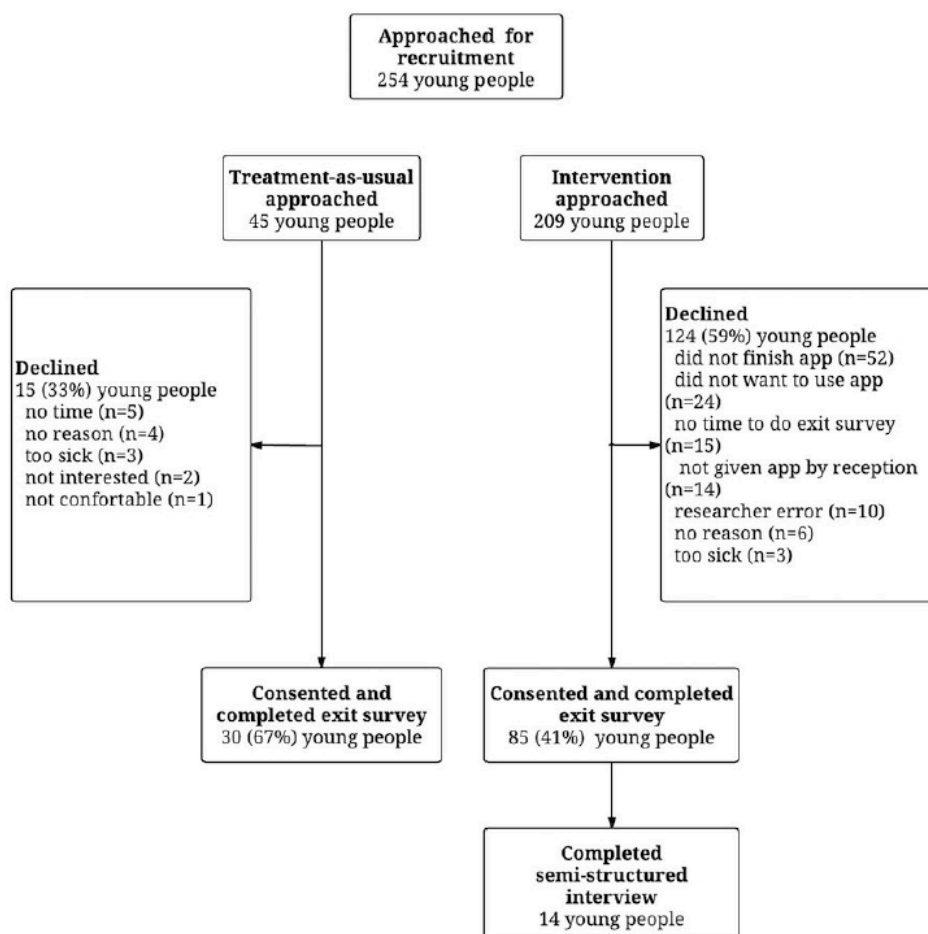
Each patient who completed an exit survey received an Aus \$10 gift voucher. Youth participants who were interviewed received an additional Aus \$30 gift voucher. The clinic received Aus \$2000 for their involvement. In addition, each receptionist received Aus \$100 at the end of the study for the additional work required of them to administer the app.

Analysis

Quantitative data from youth exit surveys were analyzed using SPSS version 23. Youth participant characteristics in the TAU

and intervention groups were compared using chi-square test for independence. Where assumptions of expected cell frequency were not met, Fisher exact test was used. Data from all scaled variables showed major deviation from the normal distribution. Transformation did not adequately improve normality, so the nonparametric Mann-Whitney *U* analysis was used to compare groups for all variables. The Mann-Whitney *U* test has the added advantage of being suitable for uneven sample sizes. In comparing disclosure ratings between groups, "not applicable" responses were not included in the analysis. Scores for patient-centered care items were combined into five core components of the patient-centered model as described by Little et al [16]: communication and partnership, personal relationship, health promotion, positive and clear approach to problem, and interest in effect on life. Items for disclosure and patient-centered care were also combined to create a total disclosure and patient-centered care score. Internal consistencies of the following were calculated using Cronbach alpha: items in each of the four patient-centered core factors, total patient-centered care, and total disclosure. Effect sizes for all Mann-Whitney *U* analyses were calculated and reported as *r* with magnitudes using Cohen criteria (.1=small, .3=medium, .5=large) [52].

Figure 1. Recruitment breakdown of young people approached in the treatment-as-usual and intervention phases of the study.



Interviews were audio-recorded and transcribed verbatim by a professional transcription service. The first author compared the transcriptions to the audio recordings to ensure accuracy before coding all transcripts using NVivo 11 software. The second and third authors used this coding structure to independently code two transcripts. All authors then met to compare codes, revising the coding structure as required. The first author recoded all transcripts using the updated coding framework before conducting a thematic analysis [53]. These themes were discussed with all authors resulting in final themes.

Results

Participant Characteristics: Quantitative Phase

All four GPs were male and reported having had previous training in adolescent health. As shown in Table 3, each GP

rated their enthusiasm for seeing a young person highly, with a mean rating of 9.5 (SD 1.3) out of 11. The participating GPs also highly rated their knowledge and confidence in consulting and communicating with young people, and exploring issues beyond the presenting problem.

Figure 1 shows the breakdown of young people who were approached and participated in the TAU and intervention phases of the study. In the TAU phase, 45 young patients were approached, of whom 30 (67%) agreed to participate. In the intervention phase, 209 patients were invited to participate, of whom 85 (40.7%) agreed. Of the 124 patients (59.3%) who declined to participate, 15 had completed Check Up GP, but did not have time to complete the exit survey.

Table 3. General practitioner (GP) self-rated enthusiasm, and knowledge and confidence of consulting and communicating with young people.

GP characteristics	GP 1	GP 2	GP 3	GP 4	Mean (SD)
Age group (year range)	45-54	45-54	45-54	55-64	
Enthusiasm for seeing young people (max=11)	10	8	9	11	9.5 (1.3)
Consulting with young people (age 14-17) (max=7)					
Knowledgeable	5	5	6	7	5.8 (1.0)
Confident	6	4	5	7	5.5 (1.3)
Consulting with young people (age 18-25) (max=7)					
Knowledgeable	5	5	6	7	5.8 (1.0)
Confident	6	5	6	7	6.0 (0.8)
Consulting with male young people (max=7)					
Knowledgeable	5	5	6	7	5.8 (1.0)
Confident	6	5	5	7	5.8 (1.0)
Consulting with female young people (max=7)					
Knowledgeable	5	5	5	7	5.5 (1.0)
Confident	6	4	5	7	5.5 (1.3)
Communicating with young people (max=7)					
Knowledgeable	5	5	5	7	5.5 (1.0)
Confident	6	4	5	7	5.5 (1.3)
Exploring issues beyond presenting problem (max=7)					
Knowledgeable	6	4	6	7	5.8 (1.3)
Confident	6	3	4	7	5.0 (1.8)

Table 4. Characteristics of youth participants in the treatment-as-usual (TAU) (n=30) and intervention (n=85) phase.

Youth characteristics	TAU (n=30)	Intervention (n=85)	Group comparison ^a	
			χ^2_1	P
Gender, n (%)			0.8	.38
Male	11 (37)	39 (46)		
Female	19 (63)	46 (54)		
Age (years), mean (SD)	19.13 (2.62)	19.93 (3.32)		
Age range (years)	14-23	14-25	0.2	.66
14-17	9 (30)	22 (26)		
18-25	21 (70)	63 (74)		
Sexuality, n (%)				
Heterosexual	27 (90)	83 (97)		.20
Bisexual		1 (1)		
Questioning	2 (7)	2 (2)		
Other	1 (3)			
Activities, n (%)				.19
Full-time work	3 (10)	16 (19)		
Part-time work		10 (12)		
Unemployed		2 (2)		
Home duties		1 (1)		
Have job, but not there due to illness		1 (1)		
Student attending school	9 (30)	22 (26)		
Student attending university	18 (60)	33 (33)		
First time at clinic, n (%)				.28
Yes	2 (7)	2 (2)		
No	28 (93)	83 (98)		
First time with doctor, n (%)				.56
Yes	6 (20)	12 (14)		
No	24 (80)	73 (86)		
Attending with parent, n (%)				.20
Yes, went into consult with young person	12 (40)	27 (31)		
Yes, but remained in waiting room		8 (9)		
No	18 (60)	51 (59)		

^aThose comparisons that were not chi-square values were calculated with Fisher exact test.

Demographic characteristics of youth participants who completed the quantitative exit survey are presented in Table 4. There were no differences between the characteristics of patients in the TAU group and those in the intervention group.

Participant Characteristics: Qualitative Interviews

Fourteen youth participants from the intervention phase participated in qualitative interviews. Of those interviewed, nine were female and five were male; three participants were aged 14 to 17 years and 11 were aged 18 to 25 years (mean 20.9, SD 3.4 years). Eight participants were university or college students, two were at high school, three in full-time employment, and

one was unemployed. Five of the 14 attended the clinic with a parent, with two of these five young people reporting their parent went into the consultation with them.

Quantitative Findings

Young people's median ratings of disclosure of health and lifestyle issues are shown in Table 5, with higher ratings indicating greater disclosure. Compared to the TAU group, young people using Check Up GP reported higher ratings of disclosure on all health and lifestyle issues, except for physical health. Median ratings of disclosure for four issues (alcohol/other drugs, sexual health, sexuality, and hurt

self/others) improved from the minimum rating (1/5) in TAU to the maximum rating (5/5) in the intervention group. Medium effect sizes were found for all domains, except for sexual activity, sexuality, and diet that each had small effect sizes.

The items for each of the five core components of patient-centered care had high internal consistency. The Cronbach alpha coefficients were .99 for communication and partnership, .97 for personal relationship, .96 for health promotion, .97 for positive and clear approach to problem, and .89 for interest in effect on life.

Young people's median ratings of patient-centered care are shown in Table 6, with lower ratings indicating greater patient-centered care. Compared to those in the TAU group, young people in the intervention group rated patient-centered care better (lower median ratings) in four of the five core factors

of patient-centered care: communication and partnership, personal relationship, health promotion, and interest in effect on life. Effect sizes were small for each, except for "interest in effect on life," which had a medium effect size. There was no difference between TAU and intervention groups for positive and clear approach to the problem.

There were no overall differences between TAU and intervention groups for patients' ratings of youth-friendly care: how comfortable they felt, the level of trust in the GP, the extent to which their service met their expectations, and whether they had enough time to ask the GP everything they wanted to. Young people in the intervention group had lower ratings for "I would lose control of my emotions" ($z=-2.087$, $P=.04$) compared to those in the TAU group. The effect size was small ($r=.19$). There were no other differences in rating of judgment.

Table 5. Youth disclosure ratings of health and lifestyle issues in the treatment-as-usual (TAU) and intervention phase.

Health domain	TAU		Intervention		<i>U</i>	<i>z</i>	<i>P</i>	<i>r</i>
	Median (IQR)	<i>n</i>	Median (IQR)	<i>n</i>				
Physical health	5.0 (2.0)	30	5.0 (2.0)	80	1042.50	-1.259	.21	.12
Home life	2.0 (1.0)	25	4.0 (3.0)	76	487.50	-3.789	<.001	.38
School/work	2.0 (2.0)	27	4.0 (2.0)	81	523.50	-4.188	<.001	.41
Bullying	1.0 (0)	22	3.5 (4.0)	56	312.50	-3.663	<.001	.41
Alcohol/other drugs	1.0 (0)	24	5.0 (3.0)	68	411.00	-3.839	<.001	.40
Sexual health	1.0 (2.0)	25	5.0 (4.0)	69	627.00	-2.168	.03	.22
Sexuality	1.0 (1.0)	24	5.0 (4.0)	66	548.00	-2.463	.01	.23
Hurt self/others	1.0 (0)	21	5.0 (4.0)	63	337.00	-3.717	<.001	.41
Mood	2.0 (1.0)	27	4.0 (2.0)	78	517.50	-4.142	<.001	.40
Addiction	1.0 (0)	19	4.5 (4.0)	58	256.50	-3.756	<.001	.43
Stressful events	2.0 (2.0)	28	4.0 (3.0)	80	611.50	-3.732	<.001	.36
Diet	3.0 (2.0)	27	4.0 (4.0)	75	706.50	-2.417	.02	.24
Exercise	2.5 (3.0)	26	5.0 (4.0)	75	607.50	-3.044	.002	.30
Sleep	3.0 (2.0)	27	4.0 (2.0)	81	681.50	-3.069	.002	.31
Risky behavior	1.0 (0)	23	2.5 (4.0)	66	475.00	-2.923	.003	.31
Safety	1.0 (0)	22	3.0 (4.0)	65	422.00	-3.129	.002	.34
Total ^a	27.5 (11.0)	30	44.5 (45.0)	84	648.50	-3.938	<.001	.37

^aCronbach alpha=.968.

Table 6. Reported ratings of patient-centered care by patients in treatment-as-usual (TAU) (n=30) and intervention groups (n=85).

Patient-centered care components	TAU, median (IQR)	Intervention, median (IQR)	<i>U</i>	<i>z</i>	<i>P</i>	<i>r</i>
Communication and partnership	26.5 (44.5)	12.0 (14.0)	849.00	-2.794	.01	.26
Personal relationship	9.5 (9.5)	4.0 (7.5)	880.50	-2.605	.01	.24
Health promotion	7.5 (5.8)	4.0 (6.0)	944.50	-2.175	.03	.20
Positive and clear approach to problem	10.5 (12.3)	5.0 (9.0)	991.00	-1.851	.06	.23
Interest in effect on life	7.0 (5.3)	3.0 (4.5)	734.50	-3.550	<.001	.33
Total ^a	54.5 (69.0)	29.0 (35)	801.50	-3.030	.002	.28

^aCronbach alpha=.991.

Table 7. Youth experience and acceptability of using Check Up GP.

Youth experience and acceptability	Not at all, n (%)	Only a little bit, n (%)	Somewhat, n (%)	Quite a bit, n (%)	Very much, n (%)
How confident are you that Check Up GP was able to provide an accurate picture of yourself to your GP?	2 (2)	4 (5)	31 (37)	37 (44)	11 (13)
How comfortable were you disclosing personal information through Check Up GP?	0	10 (12)	23 (27)	24 (28)	28 (33)
Were the questions in Check Up GP difficult to understand?	55 (65)	15 (18)	11 (13)	4 (5)	0
Did any of the questions in Check Up GP cause you to become upset?	66 (78)	10 (12)	6 (7)	1 (1)	2 (2)
To what extent did you feel your GP address the issues raised in CUGP?	3 (4)	7 (8)	17 (28)	32 (38)	26 (31)

Check Up GP was highly acceptable to patients. In all, 86% (73/85) thought the app was a “good idea,” 13% (11/85) felt unsure (“don’t know”), and only 1% (1/85) thought it was a “bad idea.” Most young people (63/85, 74%) wanted to use Check Up GP again, and only 6% (5/85) did not. Of those who wanted to use Check Up GP again, and responded to the question, more than half (36/62, 58%) wanted to use it twice a year or more, 15% (9/62) wanted to use it once a year, and a further 23% (14/62) wanted to use the app every time they saw their GP.

Table 7 shows the experience and acceptance by patients using Check Up GP. The majority of patients (48/85, 56%) were “very much” or “quite a bit” confident that the app provided an accurate picture of them to their GP. The majority of patients (52/85, 61%) were also either “very much” or “quite a bit” comfortable about disclosing personal information about themselves through Check Up GP. Most patients (58/85, 68%) reported that their GP addressed issues raised by Check Up GP “quite a bit” or “very much.” Almost all (76/85, 89%) reported that the questions caused them to become upset either “not at all” or “only a little bit.” In all, 82% of patients (70/85) rated the questions as being difficult to understand either “not at all” or “only a little bit.”

The usability and design of Check Up GP was also highly rated by patients. In all, 95% (81/85) rated Check Up GP as either being “able to use immediately” or “easy to learn” and 75% (64/85) rated Check Up GP as having either a “high level of visual appeal” or being “very attractive, memorable.”

Qualitative Findings

Our analysis of interviews with participants found four main themes: identifying unmet needs, creating scope, moderating factors for use, and future use.

Identifying Unmet Health Needs

Many participants reported that using Check Up GP helped them to identify and disclose issues that they had not previously discussed, or thought would be relevant to discuss, with their GP:

It definitely brought things up that wouldn't normally have been discussed in a consult...I feel like even the fact that those questions are being asked about your sleeping habits, your alcohol consumption, your drug use; the fact that they're being asked in a health context at all could be beneficial. [Male, 24]

In particular, participants reported that using Check Up GP made it easier to disclose sensitive issues, even though they knew the responses would be available to their GP. These young people “wouldn’t really like to tell the doctor in person...I’ve just always felt more comfortable with [technology]” (female, 19 years). There was a recognition that once the difficulty of disclosure could be overcome, problems could then be addressed:

I've wanted to bring up [mental health issues] with my doctor before and haven't because I hadn't really had the platform and felt a bit nervous about it. [Male, 23]

In addition to facilitating disclosure, it was felt that using Check Up GP enabled participants to go into the consultation feeling more prepared and in control, and knowing what topics were going to be discussed. Check Up GP allowed them to “indicate to your doctor that this is what I’m going to talk to you about and this is where I’m heading” (female, 18 years). Thus, a shared understanding of what would be focused on in the consultation was achieved through the app in a timely manner:

You and the GP are obviously on a similar understanding, and then you can get right into whatever your concerns are. [Female, 17]

Creating Scope for Addressing Unmet Health Needs

As well as facilitating the disclosure of unmet health needs, using Check Up GP created scope for addressing these needs within the consultation:

[The GP] took my responses...and gave a good reason to keep that [behavior] in check. Which I thought was good. It wasn't just tick, tick, tick, it's like he used it to explore further about my lifestyle choices and he did ask probing questions. [Male, 24]

Although participants were generally very satisfied with how their GP addressed their concerns, a few felt they did not have sufficient time because their GP was either running well behind schedule or their responses were only addressed at the very end of their consultation. However, these participants also reported that their GP invited issues to be discussed at a future time:

We didn't really address any of the problems in detail because it was towards the end of the consultation and he was going over time. But he said at the end, "If you do ever want to talk about any of these, you're more than welcome to." [Female, 23]

A positive consequence of discussing unmet needs was that many participants felt that their GP had improved their understanding of the young person's life.

When you go in sometimes you just focus on one question. So I think it was good to have a bit more of a general understanding. [Female, 24]

Indeed, the process of unpacking responses led to some participants feeling a greater sense of connection and rapport with the GP. These young people felt that their GP showed a genuine interest and "actually care about what's happening" (female, 24 years) in their lives:

They're not just saying "how's it going," they're sitting there and asking you about things that might be concerning you. [Male, 23]

In addition to addressing unmet needs, the two participants who went into the consultation with a parent reported that the GP asked for time alone. One participant reported that this was the first time that time without parents had been requested: "I've never had that before, so that was good" (female, 15 years).

Only one participant reported having a negative experience of using Check Up GP. This young person felt their GP did not adequately attempt to explore the issues raised due to a lack of time:

He just said "I don't think I need to lecture you on drugs and alcohol"...I just thought well what's the point of me putting it in there if I'm going to get a bit of a judgy comment about it rather than in an endeavor to understand a bit more to see if it's worth talking about...if he'd had more time then he would have gone into that a bit more. [Male, 23]

Moderating Factors of Use

We discovered three factors that moderated use of the tool: young people's motivation and honesty, the content and functionality of the tool, and administration.

All participants recognized the potential value of the tool, even those who had no current issues or had a good relationship with their doctor:

Perhaps it doesn't necessarily apply to me, but I can see it working really well for other people, or at least it didn't apply to me that time. Who knows in the future? [Male, 19]

Four of the five males interviewed, along with one of the nine females, volunteered that Check Up GP gave them something useful to do in the waiting room:

I get bored very easily, especially in the waiting room, and if I have something to do that is actually relevant, it definitely will be a big help. [Male, 16]

Almost all participants reported they answered questions honestly because they understood that disclosing was the aim of the app: "I wouldn't lie because I think I'm only hurting myself if I'm lying to the GP because then he's not going to be able to help me" (male, 24 years).

In contrast, five young people explained that there may be occasions when they would lie or fail to disclose the full extent of a behavior: if they were uncomfortable discussing an issue (such as sexting) or if they believed it did not affect their health:

Anything that I felt comfortable telling him, I definitely told the truth about. But there were maybe one or two things that I probably didn't want to discuss with him that I just chose not to. [Female, 23]

Another moderating factor to using Check Up GP was its content and functionality. Although participants felt there was a "good range of questions to get a general idea on someone" (female, 18 years), the language of the questions could be also perceived as "very direct and people might not want to answer that truthfully" (female, 24 years). Also, for a few participants, the length was "a little bit long because if the doctor was running on time, you probably wouldn't have enough time to finish it" (female, 25 years).

We found that the context of using Check Up GP could be an important factor influencing young people's engagement with the app. Although all young people felt they had sufficient privacy when completing it in the waiting room, a few participants also expressed the concern that their responses would be influenced if a parent or family member was sitting next to them:

If I'd been sitting next to a parent or family member, and they'd been looking over my shoulder—people curious [about] what it is—I think that would influence a lot of people's answers, my own included. [Male, 19]

Many participants felt they had received insufficient explanation about Check Up GP by receptionists. Instead, most relied on the information provided at the start of the tool or by the researcher to understand the app's purpose and how the information would be used by GPs:

Reception didn't really say much about it, which was a bit weird. But on the tool the front page gave it a pretty decent, pretty lengthy explanation (male, 19 years).

Future Use

All participants reported that they wanted to use Check Up GP regularly, when they see their GP one or two times per year. They felt that this would enable new issues that emerge to be identified and discussed:

[Twice a year] seems like the right space of time where things can change, life events happen, you know, relationships, or family members going through difficulties, yourself going through difficulties, employment changing. [Male, 19]

Participants felt regular use of Check Up GP would also ensure that issues that had emerged previously could be revisited to "see how I'm tracking" (female, 23 years).

Finally, participants suggested a number of ways that the Check Up GP app could be developed. One suggestion was adding the ability to view previous answers. Another was the ability to

receive automated, personalized health information, such as on healthy diet or exercise.

Discussion

Principal Results

This mixed methods study aimed to investigate whether the implementation of a health and lifestyle-screening app, Check Up GP, codesigned by young people and GP staff and grounded in the theories of patient-centered and youth-friendly care, improved disclosure of health risks and care experiences of young patients attending general practice. We were also interested in understanding young people's acceptance of and experience with using a screening app as part of their routine health care with their GP.

Overall, we found using Check Up GP improved disclosure across all health and lifestyle domains, including sexual health, alcohol and other drugs, and risky behavior, except for physical health where disclosure was already high. This supports previous research showing that the use of technology improves young people's disclosure of sensitive health issues [24,25]. Our qualitative interviews suggested that using Check Up GP not only led to identification of unmet needs, but created scope for discussing and addressing these needs in a way that does not usually occur for young people during routine care. It is encouraging that the majority of young people (75/85, 88%) felt the issues raised were at least somewhat addressed, particularly given previous research has found that GPs ignored certain domains identified as issues by young people [54]. It is possible that the functionality of Check Up GP for the GPs (eg, traffic-light summary report with suggested actions and referral options), in addition to the emphasis in GPs' training on the need to follow up on all raised issues, facilitated GPs in our study to more consistently address raised issues. It is also possible that the GPs in this study felt particularly engaged and skilled to address issues, and willing to spend extra time doing this.

Young people who used Check Up GP felt more prepared to discuss the issues raised in their consultation. In our quantitative findings, young people using the app were less concerned that they would lose control of their emotions than those in the TAU group. This finding was reflected in our interviews with young people, with participants appreciating that the tool provided them a chance to prepare and reflect on their responses before the consultation. In doing so, young people felt more emotionally prepared to have a conversation about sensitive issues than they otherwise would have been. Although similar results were found with young people using a screening tool with a nurse in a school setting [55], this is the first study to our knowledge that explores young people's experience of the tool in the general practice setting, outside of well-child visits.

Using Check Up GP had a profound impact on young people's perception of patient-centered care. These findings support and extend previous research that had only measured and found improvements in one element of communication [34]. As well as communication and partnership, we found that using Check Up GP improved personal relationships, health promotion, and

interest in the effect of the problem on life. In contrast, Gadowski et al [33] only found improvements in doctor engagement and no change in partnership or rapport. This difference may be due to measuring patient-centered care by analyzing audio recordings of consultations, rather than patient's own ratings. Another recently published study found no changes in communication and experience of care, or in health information [56]. However, both of these studies were conducted with young people at well visits, which are not well-attended by key subgroups of young people such as low income and uninsured [14]. Thus, our findings suggest that the use of a technology-based screening tool has the potential to transform young people's experience of care.

In contrast to patient-centered care, using Check Up GP did not improve core indicators of youth-friendly care. We found no difference between TAU and intervention groups for young people's assessment of trust, whether they had enough time to ask the GP everything they wanted to, their level of comfort, nor the extent to which the service met their expectations. There was also no change on all but one measure of judgmental reactions. The lack of improvement may be due to a ceiling effect, with these variables being rated very highly in the TAU group. Indeed, a previous randomized controlled trial of a paper-based screening tool also found youth participants rated their level of trust in their GP highly in both control and intervention groups [57]. Perhaps practices volunteering for these studies are already interested in meeting the needs of young people and therefore have high baseline scores. That there was almost no negative effect on youth-friendly variables in our study is a positive finding and suggests that this technology can be integrated into routine care and can direct focus away from the presenting issue without necessarily undermining the delivery of quality youth-friendly care. However, further research is needed to determine whether factors other than the ceiling effect or participating GP characteristics are responsible for the nonsignificant differences in youth-friendly care.

There are a number of established theories that may explain the underlying causal mechanisms of our findings. The Culture of Situated Cognition theory proposes that cultural mindsets influence what feels fluent and what is engaged with [58]. Drawing on this theory, the patient decision aid theoretical framework developed by Alden and colleagues [59] proposes that patient screening and decision aids that are culturally targeted to specific cultural groups, using appropriate imagery, evidential information, linguistics, and values relevant to that group, will enhance feelings of congruency with the material, thereby increasing "processing fluency." Improved processing fluency in turn predicts enhanced preparedness (eg, confidence and openness to participating) leading to improved outcomes. In addition, in the context of technology and using the Stimulus-Organism-Response theory, Jiang and colleagues [60] demonstrated that interactive features or cues on websites trigger a greater cognitive and emotional involvement of users, which in turn elicit desired behaviors. Thus, these theories would predict that an interactive technology-based screening tool that is designed specifically for a youth subculture is likely to enhance processing fluency and increase engagement, resulting

in increased disclosure and perceptions of patient-centered care. Further research is needed to further explore the underlying causal mechanisms with this technology.

A particularly interesting finding from the qualitative interviews was the dynamic nature of honesty in participants' responses on Check Up GP. For these young people, honesty was not a binary but was fluid, considered and controlled by the young person. Indeed, a substantial minority (31/85, 37%) reported that Check Up GP only "somewhat" provided an accurate picture of them. Given this was the first time participants had used such a tool, it may be that, understandably, young people wanted to "test the water" with their GP, to ensure any disclosure would be addressed with sensitivity. Alternatively, it may be that some participants were not yet ready to acknowledge they had a problem or to change their behavior. Perhaps using an app, such as Check Up GP, has the potential to be a catalyst for young people to reflect on their health and lifestyle and to begin the process of behavior change.

A positive finding of this study was the high proportion of young people who not only assessed Check Up GP as a "good idea," but who also wanted to continue to use it at least once a year as part of their routine care. Although best practice guidelines recommend this type of screening to be done annually [20,21], and previous studies of technology-based [39] and paper-based [57] screening have also found a high acceptance rate, there has been no research on whether young people themselves want to be screened regularly for health and lifestyle issues. Our results suggest that young people see value in this kind of technology being integrated into their routine care with their GP.

Finally, our findings suggest that administration of the app may influence young people's engagement with and use of Check Up GP. Most young people we interviewed felt that they did not receive adequate explanation from the clinic about Check Up GP. We also found that 42% (52/124) of young people who were not eligible to be included in the study were excluded because they did not have time to finish Check Up GP in the waiting room before their consultation. The introduction of technology into general practice needs to ensure all young people have the opportunity to use and benefit from it. There is now a solid body of research to suggest that the implementation of technology in health settings such as general practice is determined by interrelated individual, organizational, and social factors [61]. Further research is needed to understand how a screening app for young people can be successfully integrated within a general practice setting; another component of this study will address this theme in future work.

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Limitations

This study had a number of limitations. Because it was conducted at one clinic in a relatively socioeconomically advantaged area of one city, the generalizability of results may be limited. The four participating GPs were all male and of a similar age, all had previous adolescent health training, and all reported being highly confident and knowledgeable in consulting with young people. It is possible that GPs with less experience and enthusiasm for young people may not use and engage with Check Up GP in the same way as the GPs in this study, which in turn may influence young people's experience of using it within their routine care. Young people in other socioeconomic areas may experience Check Up GP differently to those in this study. Another limitation of our study is that it did not have an experimental design and so did not have a randomized control group. Although we found no significant difference between the TAU and intervention groups in the quantitative data in key characteristics such as gender, age, and sexuality, it is possible that there were underlying and unidentified differences between the two groups.

Future Research

This implementation study of a health and lifestyle-screening app for young people was conducted in one general practice clinic. Further research is needed to investigate the effect of using a health and lifestyle-screening app in a diverse range of clinic types and settings, and with a diverse range of GPs and youth participants. Future research could also investigate whether improvements found in this study are sustained over time and influence young people's health and lifestyle. Finally, there is a need to explore the experience of PCPs and practice support staff in integrating Check Up GP into their clinical and administrative work, respectively; we will report on that phase of the study in the future.

Conclusions

Previous research has found that using a technology-based health and lifestyle-screening tool as part of routine care can improve disclosure and communication with health professionals, which aids in early identification of issues and delivery of preventive health care. This study extends this research by providing new insights about the use and experience of using such an app by young people as part of their routine care in general practice. The results suggest that integrating a health and lifestyle-screening app into face-to-face regular care can enrich young people's experience of seeing their GP, create scope to address unmet health needs, and become integrated into their regular health care.

Conflicts of Interest

None declared.

Multimedia Appendix 1

App screen grabs of Check Up GP youth and general practitioner interface.

[PDF File (Adobe PDF File), 380KB - [mhealth_v5i8e118_app1.pdf](#)]

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Abbreviations

GP: general practitioner
 PCP: primary care provider
 SMS: short message service
 TAU: treatment as usual

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Check Up GP: Youth interface

CHECK UP GP

Thanks for choosing to complete the Check Up GP survey. 

EMAIL

FIRST NAME

SURNAME

DATE OF BIRTH

Day Month Year

GENDER

Female ☐

Male ☐

Transgender ☐

Intersex ☐

Other ☐

Check Up GP: Youth interface

LOGOUT

CHECK UP GP

SECTION: HOME

We're in the middle of this section. Let's power through and finish it!

GOI ↴

OR

CLOSE SECTIONS

HOME

GO ↴

EDUCATION / EMPLOYMENT

GO ↴

EATING, SLEEPING AND EXERCISE

GO ↴

ACTIVITIES AND PEER RELATIONSHIPS

GO ↴

DRUGS

GO ↴

SEXUALITY / SEXUAL HEALTH

GO ↴

MENTAL HEALTH

GO ↴

SAFETY

GO ↴



Have you ever felt threatened or unsafe because of someone you are (or were) in a relationship with?

NO

☒

Yes

 I want to talk about this with my GP

DON'T WANT TO ANSWER

CONTINUE

Have you ever ridden in a car driven by someone (including yourself) who was high or had been using alcohol or drugs?

NO

☒

Yes

 I want to talk about this with my GP

DON'T WANT TO ANSWER

CONTINUE

Check Up GP: GP interface

INDIVIDUAL REPORT

[PRINT](#)[SAVE](#)[IMPORTANT INFO](#)[CLOSE](#)

Name: Shaunagh O'Sullivan Gender: Female D.O.B: 04/01/1992 Age: 24 Sexuality: Heterosexual / straight Results Gathered: 6 Jun 2016

REPORT

[CHECK FOR UPDATES](#)[Expand All](#)[Collapse All](#)

+ HOME

Concerning

+ EDUCATION / EMPLOYMENT

Very Concerning

+ EATING, SLEEPING and EXERCISE

OK

+ ACTIVITIES AND PEER RELATIONSHIPS

OK

+ DRUGS

OK

+ SEXUALITY / SEXUAL HEALTH

OK

+ MENTAL HEALTH

OK

+ SAFETY

OK

+ OTHER

OK

Check Up GP: GP interface

INDIVIDUAL REPORT

[PRINT](#)[SAVE](#)[IMPORTANT INFO](#)[CLOSE](#)

Name: Shaunagh O'Sullivan Gender: Female D.O.B: 04/01/1992 Age: 24 Sexuality: Heterosexual / straight Results Gathered: 6 Jun 2016

REPORT

[CHECK FOR UPDATES](#)[Expand All](#)[Collapse All](#)

HOME

SHOW: [CONCERNING & FLAGGED ONLY](#) [ALL ITEMS](#)

Question	Response	Suggested Action
4. Have you experienced any of the following over the past 12 months (choose as many as applies to you):	- You started/finished uni or college - A family member or close friend had (or has) a serious illness or injury	- Empathise and normalize - Assess safety, explore coping strategies, sources of support - Identify and reinforce strengths and protective factors (e.g. school connection, peer relations) Referrals - Info, tools to promote wellbeing and resilience: Biteback - Lifeline 131 114, Kids Helpline 1800 55 1800, eheadspace.org.au 1800 650 690 - Counselling: headspace Camberwell 9008 6500 - Information and counselling: National Sexual Assault, Domestic and Family Violence Counselling Line 1800 737 732 - Guided meditation app: Smiling mind

EDUCATION / EMPLOYMENT

[Very Concerning](#)

EATING, SLEEPING and EXERCISE

[OK](#)

6.3 Chapter summary

In this chapter, to address research question 3, I investigated how using a screening app ('Check Up GP') influenced young people's assessment of the quality of their care and their disclosure of sensitive issues in general practice. I also explored young people's experience and willingness to use the app as part of their routine care. Supporting and extending previous research, the quantitative results indicated that using Check Up GP both increased young people's disclosure and improved their assessment of patient-centred care. Thematic analysis of semi-structured interviews with 14 young people who had used Check Up GP found that using the app created scope to address unmet health needs. A high proportion of young people assessed Check Up GP as a "good idea" and most wanted to continue to use it at least once a year when attending general practice. In the next chapter, I present the findings of a case study investigating the implementation of Check Up GP.

7 Experiences of general practitioners and practice support staff using a health and lifestyle screening app in primary health care: implementation case study

7.1 Chapter overview

Chapter 7 presents the final of four research articles prepared during my candidature. The paper presents the findings of Study 3b of my thesis, an in-depth implementation case study, using methodology informed by action research and Normalisation Process Theory, to explore how a screening app for young people is integrated by GPs and practice support staff into their day-to-day work in general practice. This paper was peer reviewed and published in *JMIR mHealth and uHealth* in April 2018. The chapter concludes with a summary of the key findings related to research question 4 of this thesis, which was addressed in this study.

7.2 PDF of paper

Original Paper

Experiences of General Practitioners and Practice Support Staff Using a Health and Lifestyle Screening App in Primary Health Care: Implementation Case Study

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Abstract

Background: Technology-based screening of young people for mental health disorders and health compromising behaviors in general practice increases the disclosure of sensitive health issues and improves patient-centered care. However, few studies investigate how general practitioners (GPs) and practice support staff (receptionists and practice managers) integrate screening technology into their routine work, including the problems that arise and how the staff surmount them.

Objective: The aim of this study was to investigate the implementation of a health and lifestyle screening app, Check Up GP, for young people aged 14 to 25 years attending an Australian general practice.

Methods: We conducted an in-depth implementation case study of Check Up GP in one general practice clinic, with methodology informed by action research. Semistructured interviews and focus groups were conducted with GPs and support staff at the end of the implementation period. Data were thematically analyzed and mapped to normalization process theory constructs. We also analyzed the number of times we supported staff, the location where young people completed Check Up GP, and whether they felt they had sufficient privacy and received a text messaging (short message service, SMS) link at the time of taking their appointment.

Results: A total of 4 GPs and 10 support staff at the clinic participated in the study, with all except 3 receptionists participating in the final interviews and focus groups. During the 2-month implementation period, the technology and administration of Check Up GP was iterated through 4 major quality improvement cycles in response to the needs of the staff. This resulted in a reduction in the average time taken to complete Check Up GP from 14 min to 10 min, improved SMS text messaging for young people, and a more consistent description of the app by receptionists to young people. In the first weeks of implementation, researchers needed to regularly support staff with the app's administration; however, this support decreased over time, even as usage rose slightly. The majority of young people (73/87, 84%) completed Check Up GP in the waiting room, with less than half (35/80, 44%) having received an SMS from the clinic with a link to the tool. Participating staff valued Check Up GP, particularly its facilitation of youth-friendly practice. However, there was at first a lack of organizational systems and capacity to implement the app and also initially a reliance on researchers to facilitate the process.

Conclusions: The implementation of a screening app in the dynamic and time-restricted general practice setting presents a range of technical and administrative challenges. Successful implementation of a screening app is possible but requires adequate time and intensive facilitation. More resources, external to staff, are needed to drive and support sustainable technology innovation and implementation in general practice settings.

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KEYWORDS

adolescent; primary health care; primary prevention; health behavior; quality improvement; telemedicine

Introduction

Screening Young People for Mental Health Disorders and Health-Compromising Behaviors

A range of mental health disorders and health-compromising behaviors emerge during adolescence and young adulthood, compromising current and future health and well-being [1]. Best practice guidelines recommend regular screening of young people for health and lifestyle issues in primary care to detect and intervene with problems early [2,3]. Screening increases appropriate referrals to specialty care [4] and the provision of health education materials [5] and may improve health outcomes [6]. However, many young people face barriers to disclosing health risks, and many clinicians run out of time or are concerned to ask about sensitive issues, especially if not directly related to the presenting issue [7,8]. Technology-based screening has the additional advantages of being engaging and efficient [9].

Our own prior research with 85 young people found that using a health and lifestyle screening app increased disclosure, patient-centered care, and preparedness of young people attending general practice. It created scope to address unmet health needs, without negatively affecting indicators of youth-friendly quality care, such as privacy and trust in their general practitioner (GP) [10]. In our study, we found that only 14.4% (30/209) of the eligible patients did not use the app, either because they did not want to use the app (n=24) or for no provided reason (n=6) [10]. We also found that young people rated this screening technology as highly acceptable and very easy to use, and most of them wanted to use the screening app regularly as part of their routine care with their GP [10]. However, despite the demonstrated benefits and need, the rate of using digital technology beyond a basic electronic health record in primary care settings is low [11,12].

Implementation of Interventions to Improve Health in Primary Care

Translating evidence and clinical guidelines into routine practice is typically slow and erratic and can result in suboptimal care and patient exposure to unnecessary risks [13]. A challenge for knowledge translation into primary care is the complexity of the setting, where multiple agents, such as patients, GPs, and practice support staff (receptionists and practice managers), are interacting at and across multiple levels, including organizationally and individually, and not always in a predictable manner [14]. The fit between an intervention and these dynamic contextual factors has been found to be critical in determining the success of an implementation in shortening the evidence-to-practice gap [15].

The Medical Research Council, which coordinates and funds medical research in the United Kingdom, recommends a staged and iterative process for the development, evaluation, and implementation of complex interventions to improve health [16,17]. Complex interventions comprise several components

which interact and do not necessarily relate linearly or predictably [16]. An iterative approach to tailoring interventions, repeatedly reflecting on results and refining, is particularly appropriate for the implementation of health technology, a complex intervention which is influenced by underlying and multifaceted interrelated technical, social, and organizational factors [18].

Reflecting the growth of implementation research, multiple theories exist to explain how and why implementation succeeds or fails [19]. Normalization process theory (NPT) provides a particularly appropriate theoretical lens to investigate the implementation of a screening technology in the primary care setting and has been widely used [20-22]. Unlike most other theories, NPT accounts for the important social aspects of the implementation of health technology, including the work required to make sense of the technology and its effects on roles and responsibilities [20]. NPT describes how complex practices and technology innovations become embedded and integrated into health care settings [23,24] and posits that implementation is operationalized in social contexts, including work settings, through 4 key mechanisms: coherence, how participants make sense of an intervention; cognitive participation, commitment and engagement by participants; collective action, the work participants do to make the intervention function; and reflexive action or how participants reflect in appraisal of the intervention after it has been in use.

Experience of Clinicians and Support Staff in Implementing Technology-Based Screening for Young People in Primary Care

Health care providers have reported that using a technology-based screening tool facilitates identification of and communication about risky behaviors [9], while pediatric primary care providers report that these tools improve visit organization and efficiency [25]. Little is known about how GPs integrate screening technology into the context of routine clinical care. One study found that using a quality improvement framework resulted in increased rates of comprehensive screening and counseling for adolescents [26], but this study was conducted in predominantly pediatric settings and did not use technology. In the United States, where young people may attend planned well-child consultations, which devote time to screening and intervention, less than 50% do so [27,28], which is why it is important to investigate whether primary care providers are able to use a technology-based screening tool during consultations in which young people present acutely with any health issue in a primary care setting. This investigation is even more pertinent for generalist primary care services which are a gateway to specialist services, such as general practice in the United Kingdom, Australia, New Zealand, and Canada, which treat patients of all age groups and thus have to balance patient care processes for each group.

In addition, as the interface between the health care system and the community [29], support staff are typically the staff responsible for administering screening tools required to be

completed by patients before the consultation. Support staff have highly demanding and complex roles [30], yet they also report having limited agency [31], which is known to impede implementation in primary care [15]. Despite their central role, there is a paucity of studies that explore the needs and experiences of support staff in implementing technology-based screening tools.

Aim of This Study

The aim of this study was to investigate the implementation of a codesigned health and lifestyle screening tool (“app”), Check Up GP, for young people in an Australian general practice. We used NPT to explore both the experiences of support staff in administering an app to young patients and how GPs integrated the screening tool within their routine care of young people attending a general, rather than youth-specific primary health care setting. The codesign process for Check Up GP has been described in a previous conference publication and included input from young people, parents, support staff, and GPs [32].

Methods

Study Design

We conducted a 2-month in-depth implementation case study of Check Up GP in one general practice clinic, with methodology informed by the action research approach. Case study research is a particularly useful method for investigating complex social interventions and settings in health care [33], including technology-related innovations [34]. Action research aims to involve stakeholders in the implementation of change and generation of knowledge in a real-world setting through a cyclical process of collecting, feeding back, and reflecting on data [35,36]. A Plan-Do-Study-Act (PDSA) framework was used to help the clinic structure the iterative improvement of Check Up GP and its administration in rapid quality improvement cycles [37]. The PDSA framework has the advantage of being recommended to general practices to use in quality improvement activities by the Royal Australian College of General Practitioners, the peak accreditation body for GPs in Australia [3]. The 2-month length of the study was reached by agreement with the clinic before the commencement of the study. The study received ethics approval from the University of Melbourne (Ethics ID #1544281).

Recruitment

The clinic was recruited through the Victorian Primary Care Practice-Based Research Network, managed by the Department of General Practice at the University of Melbourne. The 4 GP principal owners and all support staff participated in the study. The support staff consisted of a practice manager, a reception coordinator, and 8 receptionists, with all except 3 receptionists participating in the final interview.

The site chosen met 4 key criteria for selection in this case study. We wanted a traditional group practice that is run by GPs rather than a corporate chain practice, a community health center, or a bulk billing clinic (services covered by Australia’s Medicare system of free universal health insurance), as traditional group practices form the majority of primary care practices within Australia. We wanted a practice that was interested in young

people and saw enough young people in the age group of 14 to 25 years but was also a generalist practice caring for patients from cradle to grave. We wanted a practice that was comfortable with using technology and willing to work on integrating it but was not highly tech savvy as most of the practices in Australia have only a basic level of tech use (most only use technology for appointments, pathology, prescriptions, and billing [11,38]). We needed a site where most patients would be able to read and understand English, the language used in this prototype of the tool.

Case Study Context

Using the macro, meso, and micro typology developed by Bronfenbrenner [39], the context of the case study is described below.

Macro Level Contextual Factors

The clinic is located in an inner urban suburb of Melbourne, Australia, just over 10 km east of Melbourne’s central business district. It is in a Local Government Area (LGA) ranked in the 98th percentile in Australia’s Index of Relative Socioeconomic Disadvantage [40], indicating a relative lack of economic and social disadvantage. Compared with the whole of Australia, the LGA has a similar mean age (LGA=37.7 years, Australia=37.2 years) [41] and proportion of young people aged 15 to 24 years (LGA=27,243 / 177,361; 15.36% [41], Australia=3,172,058 / 24,206,201; 13.01%) [42]. However, the LGA has a higher median income (LGA=Aus \$56,451, Australia=Aus \$46,854) [41] and proportion of completion of secondary education (LGA=74.8%, Australia=51.8%) [41]. The unemployment rate of the LGA is similar to the national average (LGA=4.5%, Australia=5.6%) [41], though the proportion of people born overseas is lower (LGA=30.9%, Australia=35%).

Meso Level Contextual Factors

Established in 1902, the clinic is in a freestanding converted house located in a residential area at the edge of a local shopping village. Open 365 days per year, it is a large clinic with 12 GPs (4 principal owners and 8 GP employees or associates, totaling a full time equivalent (FTE) of 7.2), 5 registered nurses (FTE 2.15), a practice manager (PM; FTE 1.0), a reception coordinator (RC; FTE 1.0) and 8 receptionists (FTE 4.8). Colocated at the clinic are a podiatrist, dietitian, and a pathology service. It is a mixed private and bulk-billing practice with approximately 30% of patients being Health Care Card holders (the Health Care Card is provided by the Australian Government to those on certain government benefits, entitling the holder to concessions on the cost of health services and medicines). Those younger than 16 years, and pensioner and concession card holders (provided by the Australian Government to those receiving old age, carer, or disability pensions) are only bulk billed between 10:00 AM and 4:00 PM from Monday to Friday, though the GPs have the discretion to bulk bill during other times. As a general practice, every GP sees patients across the life span, including young people, and between 46 and 100 young people aged 14 to 25 years attend the clinic each week.

Micro Level Contextual Factors

The clinic uses a commercial clinical electronic health record software package for appointments and patient files. They have

recently started using the software's automated SMS text messaging (short message service, SMS) function to send bulk appointment reminders and health care recall messages to patients. Organizing these SMSs is the responsibility of one support staff member (the reception coordinator); so other receptionists neither use nor are familiar with using this SMS functionality. Before this study, neither the GPs nor support staff had prior experience with introducing new technology or apps into their work, though they were interested in the potential of technology to improve their work. Apart from new patient forms, receptionists did not have experience with asking patients to complete any offline or Web-based screening or other preappointment forms. The clinic does not have wireless Internet in the clinic, and new patient information is collected via paper forms and then transcribed by receptionists into their software. The GPs are used to checking clinical information, such as pathology results, before seeing their patients, though they do not typically navigate away from their clinical software to other websites during consultations.

The 4 GP principal owners are usually the instigators of change, and it is the PM's responsibility to show support and sustain momentum. The principal owners oversee the clinical function and are responsible for the GPs and nurses. The PM has complete autonomy over administration: receptionists report to the RC, and the RC reports to the PM. The PM and principal GP owners together form the senior management team. Clinical meetings involving all doctors are scheduled once in every 6 weeks, administration meetings (including one principal GP) are scheduled once in every 3 months.

As reported previously [10], the GPs rated highly their enthusiasm for seeing young people and their knowledge and confidence in consulting and communicating with young people and their confidence in exploring issues beyond the presenting problem.

Measures

At the beginning of the study, GPs and support staff participants were asked to rate their technology adoption at home and at work on a scale (from 1=slow adopter to 5=innovator). At the end of the implementation, semistructured interviews and focus groups were conducted in-person with GPs and support staff by MW. The interview guide (Multimedia Appendix 1) was informed by the 4 core constructs of NPT to explore participants' experience of implementing Check Up GP. During the implementation period, researchers recorded the number of times that we needed to provide support to staff on using the app. Young people completed an exit survey immediately after their consultation. Results on what young people thought about using the app as part of their routine health care and the impact on their experience of care are reported in a previously published paper [10]. In this paper, we report on new data from young people concerning the implementation of the app: where they completed Check Up GP, if they received an SMS with a link to Check Up GP before attending the practice, and if they felt they had sufficient privacy.

Intervention

The content and design features of Check Up GP are described in detail elsewhere [10]. In brief, the app consisted of 2 parts: the questionnaire answered by patients and the GP summary report. The questionnaire was adapted from the HEEADSSS (Home environment, Education and employment, Eating, peer-related Activities, Drugs, Sexuality, Suicide and depression, Safety from injury and violence) preventive health framework for interviewing adolescents [43,44], covering the range of mental, physical, and social issues and behaviors commonly experienced by young people. Questions from validated screening instruments were included to capture depression (Patient Health Questionnaire-2) [45], generalized anxiety disorder (Generalized Anxiety Disorder-2 scale) [46], eating disorders (Sick Control One stone Fat Food questionnaire) [47], and substance-related risks and problems (Car Relax Alone Forget Friends Trouble test) [48]. Youth responses to the questions in the app were immediately conveyed to their GP via a secure website. This summary highlighted areas of concern and strengths as well as tips on youth-friendly consultations and suggested actions to take on areas of concern, including referral options, information, and resources.

Receptionists were trained to inform young patients aged 14 to 25 years of participating GPs that Check Up GP was available when they phoned the clinic to take an appointment. The receptionist then created a flag in the clinical software signaling the reception coordinator to send the patient a link to Check Up GP via an SMS message (sent from the clinical software). When a young patient arrived at the clinic for their appointment, receptionists asked the young person if they had received the SMS; if not, the young person was given an Apple iPad and asked to complete the tool in the waiting room before their consultation. Once the tool was completed, the receptionist notified the GP via the clinical software that the GP summary report was available for checking.

Procedure

At the start of the study period, all participating GPs and support staff met with the researchers (MW, GW, LS) and were given an overview of the study. In accordance with the iterative and participatory nature of the action research approach, we worked closely with staff during the intervention period to facilitate improvements to the process in rapid quality improvement cycles. A researcher was always present in the practice's waiting room during the intervention to collect exit surveys from young people immediately after the consultation and to provide implementation support to staff if requested. Also, at the beginning of the study period, because the clinic did not have wireless Internet, we set up a wireless dongle in the waiting room to enable patients to complete Check Up GP in the clinic and for the results to be immediately available to the GPs.

Young patients were recruited in the waiting room upon arrival to the clinic. If they were seeing a participating GP and aged 14 to 25 years, the researcher provided them with information about the study. If they agreed to participate, the young patient was asked to take a form into their consultation for their GP to assess their eligibility to participate in the study. Patients were excluded from the study if their GP assessed that their patient

was very unwell (eg, vomiting, weak, psychotic), unable to read or speak English, or if they were younger than 18 years and not a mature minor [49]. The patient handed the form back to the researcher on returning to the waiting room. Immediately after their consultation, each youth participant completed the short exit survey on a tablet in the waiting room with consent provided at the start of the survey.

During the 2-month implementation phase, the researchers communicated regularly with the PM and met twice with the GPs during a 30-min lunch break, using the PDSA framework as a structure for quality improvement discussion. At these meetings, we presented a summary of results from youth exit surveys to that date, including rates of youth-rated patient-centered care and disclosure. We then asked staff to reflect, identify, and resolve challenges or problems with either the implementation or the tool itself. These meetings also provided an opportunity to share feedback on initial findings, ensure the practice remained engaged, and celebrate successes. On the basis of staff needs, changes were made to the tool and how the tool was implemented by staff. We were unable to meet the receptionists as a group due to lack of availability, so ad hoc sessions were run with individual receptionists during quiet times in the waiting room. We also distributed a number of supporting documents to receptionists: a Frequently Asked Questions document to clarify and reiterate procedures, such as recommended phrases to use when informing young people about the tool and a summary of anonymized results from young people's exit surveys, including ratings of disclosure and patient-centered care.

The clinic received Aus \$2000 for their involvement (Aus \$1000 at the beginning and another Aus \$1000 at the end of the study), and each support staff received an Aus \$100 gift voucher at the end of the study in recognition of the additional work required of them to participate in the study. Involvement in the study was also an approved activity of the Quality Improvement and Continuing Professional Development program for GPs through the Royal Australian College of General Practitioners.

Analysis

Interviews with GPs and support staff were audio-recorded and then transcribed verbatim by a professional transcription service. The first author listened to all interviews to ensure the transcripts accurately reflected the audio recordings. Transcripts were coded by the first author using NVivo 11 (QSR International, Melbourne) software. The second and third authors used this coding framework to independently code 2 transcripts: an interview with a GP and an interview with a receptionist. All authors then met to compare codes, revising the coding structure as required. The first author subsequently recoded all transcripts using the updated coding framework, before conducting a thematic analysis [50], with themes mapped to the corresponding core NPT constructs. The authors, of whom one is also a practicing GP (LS), met regularly to discuss emerging themes and resolve any differences until a final set of themes was agreed upon. Descriptive statistics were used to analyze results from

the youth exit survey (where young people used Check Up GP, whether they received an SMS with a link to it before attending the practice, and whether they felt they had sufficient privacy). Ratios were calculated of both usage and support provided to total eligible patients.

Results

Participant Characteristics

All 4 participating GPs were male, with three aged between 45 and 54 years and one aged between 55 and 64 years. All the 10 support staff who consented and participated were female. Of the 7 support staff who completed the demographic survey and participated in the final interviews, 2 were aged between 25 and 34 years, 1 was aged between 35 and 44 years, 2 were aged between 45 and 54 years, and 2 aged between 55 and 64 years. Compared with support staff ($n=10$), GPs ($n=4$) rated their technology adoption lower (between 1=slow adopter and 5=innovator) in both work and home settings (GP work mean=2.75, SD=1.26, GP home mean=3, SD=1.41, support staff work and home mean=3.9).

The characteristics of the young people who used Check Up GP are reported in detail in a previously published paper [10]. Briefly, of the 85 young participants who used the app, 54% (46/85) were female and the remaining 46% (39/85) were male. The mean age of youth participants was 19.9 years (SD 3.32). Just over half of young people (51/85, 59%) did not have a parent or guardian with them at the clinic.

Implementation Activities

As shown in Figure 1, during the implementation period, the design of Check Up GP was improved iteratively after 4 major PDSA quality improvement cycles in response to the needs of GPs and support staff. Changes that were made to the tool and its administration resulted in the following: a reduction in the average time taken to complete Check Up GP from 14 min to 10 min, an updated SMS message for young people, and a more consistent and improved description of the app for receptionists to use when speaking with young people.

Rates of Youth Usage and Support Provided to Staff

Table 1 shows, in each week of the 2-month implementation period, the usage of Check Up GP by young patients, the number of times research assistants helped GPs and support staff with administering Check Up GP or technology problems, and the ratios of both usage and support to total eligible patients. The ratios show that, although the proportion of usage of Check Up GP by eligible patients increased slightly throughout the study period, the proportion of support required by staff to eligible patients declined.

Postimplementation Staff Interviews and Focus Groups

Our findings from the staff interviews and focus groups conducted at the end of the intervention are structured here within the 4 core constructs of NPT.

Figure 1. Iterative cycles of quality improvement (QI) activities and results using the Plan-Do-Study-Act framework by general practitioners (GPs), practice manager (PM) and receptionists during the implementation of Check Up GP. FAQ: frequently asked questions; SMS: short message service.

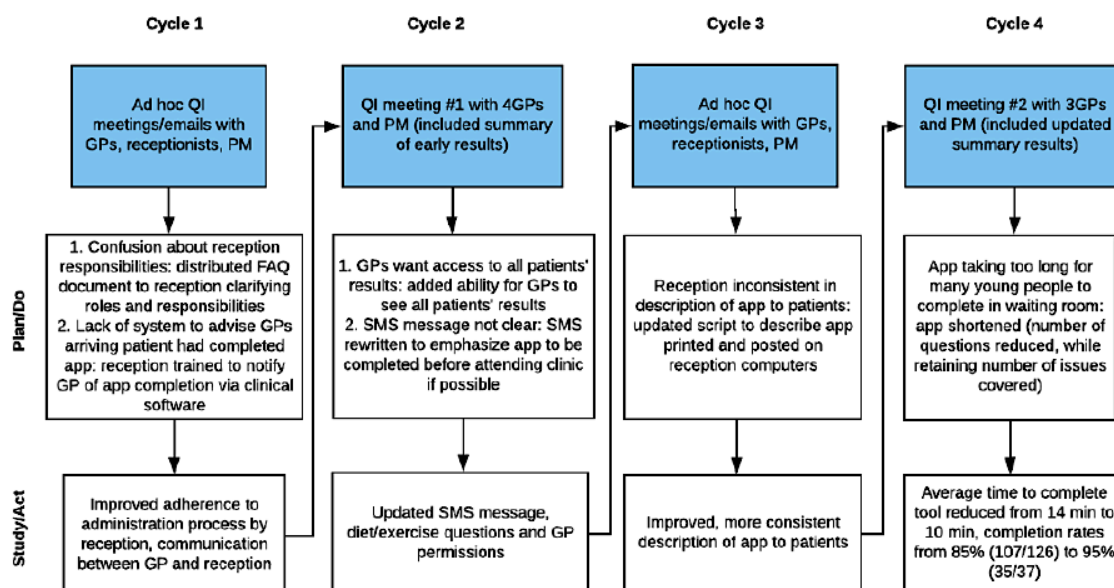


Table 1. Check Up GP rates of patient usage and support provided to staff and ratios of usage and support provided to total number of eligible patients.

Patient usage and support provided to staff	Week 1 ^a	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8 ^a
Patient usage	7	18	10	9	13	6	12	9
Number of times support provided to staff	19	19	14	11	6	3	5	5
Total number of eligible patients	22	31	30	21	25	12	25	17
Usage: total eligible patients	0.3	0.6	0.3	0.4	0.5	0.5	0.5	0.5
Support: total eligible patients	0.7	0.6	0.5	0.5	0.2	0.2	0.2	0.3

^aWeek included 1 day of public holiday when only one GP worked and clinic opened for 4 hours instead of normal 12 hours.

Coherence

Both support staff and GPs could identify the purpose of Check Up GP and the potential benefits for young people using the tool. They felt that a key benefit of the tool was that young people's comfort with technology would facilitate disclosure of health and lifestyle issues:

I think it's a user-friendly way for the young generation, who are so comfortable with electronics, to bring up topics that they don't particularly feel comfortable doing face-to-face...it means the doctors find out more than they probably would have. [PM]

This is an amazing opportunity to speak to young people about all sorts of stuff that they would never ever have spoken about before. [GP 4]

Although Check Up GP was viewed as being beneficial, GPs also speculated about 2 potential problems with using it. One GP felt that young people's responses may be impetuous or fleeting and not necessarily provide an accurate reflection of their health and lifestyle:

You've got the impulsivity of the kids as well coming in [saying] "Oh, this is how I feel this morning. I

don't actually feel that bad, it's just what I wrote because I got out of the wrong side of bed this morning." [GP 4]

The experience of another GP was that not all his patients were receptive or had a positive experience of using Check Up GP:

There was a small number who didn't really think it was very helpful or there were some who actually openly thought it may not be good but most were very open to it. [GP 1]

Staff could make sense of the tool by comparing it with similar existing or previous interventions:

We do the same thing with 45 to 49 year old health check...and it's a little bit similar isn't it. [GP 1]

We do surveys and things all the time. [Receptionist 1]

Cognitive Participation

All staff interviewed felt that implementing Check Up GP was part of their existing job description and responsibilities. Support staff reflected that they were regularly required to integrate new systems or processes, which could originate from within the clinic, such as a new telephone system, or externally, such as

new billing requirements from Medicare (the Australia Government's public health insurance scheme). The staff's understanding of the purpose of Check Up GP also seemed to facilitate their acceptance and buy-in of using the tool. One of receptionists stated:

It's just part and parcel of the job. I think we should be expected to do it. It's for patients and we're here to provide a service, so yeah. [Receptionist 5]

Cognitive participation was evident in the way in which staff took initiative and invested time to improve the administration of Check Up GP throughout the implementation period. For example, it took some time for receptionists to normalize the correct script for describing Check Up GP to young people. One receptionist said:

You [researcher] spoke to [the practice manager] at one point; you said let's get the receptionist to say this [how the app was described to the patient], I cut that out and I put it on my keyboard, and I stuck it down with sticky tape. [Receptionist 2]

Collective Action

We found that collective action was the biggest challenge for the implementation of Check Up GP. Administering the app presented significant additional work for support staff, who were already busy and had limited time to learn and integrate the new process into their work. For instance, the PM said:

There was lot of stress from them about an additional task. They're constantly multi-tasking, there are a number of lines on hold, doctors who want attention right now. So it is a busy environment. [PM]

The task of sending the link to Check Up GP by SMS, one of the core requirements of using the tool, was particularly time-consuming, creating a substantial amount of additional work for the RC. Unlike the automatic patient appointment reminders that are sent by the clinical software, the Check Up GP SMSs were not integrated with clinical software and had to be manually sent for each patient. In the words of an RC:

You had to look at the upcoming appointments, check who fit into the category. Then you go into another screen on the computer and write up the message, and make sure that you send them to all. And then you go back into the name and you put under the alert that you note that you have send them the SMS...[The time it takes] depends how many patients you had on the day...at one stage we had about 12 that required a bit, that took at least almost 40 minutes to do. [RC]

Lack of time was also a factor that influenced GPs use of Check Up GP. Using the app inherently added additional time to a consultation and GPs felt they had to rush to address all issues raised. For one GP who always ran to schedule, there was often not enough time for patients who did not arrive early to complete Check Up GP in the waiting room as this GP was not prepared to run even a little over time or to wait for young people to complete Check Up GP. Another GP felt that it was feasible to continue to use Check Up GP as part of young people's routine

care, though not at certain times, such as on weekends when only one GP works or during very busy periods.

Perhaps reflecting the time pressures and additional work, staff compliance with using Check Up GP was not always consistent, especially at the start of the implementation period. It took time for receptionists, particularly those working part-time, to understand what was required and to normalize the procedure. One of the receptionists stated:

I found in the beginning it was quite overwhelming because I was here part-time...when you first started it, I'm thinking, "What is going on here?" [Receptionist 1]

Inconsistent compliance by receptionists in administering Check Up GP required intervention by a GP at one point in the intervention:

A couple of times we had to say [to receptionists]: "look, do you know what, this is not an optional thing, this is actually what we've chosen to do and it's important and this is part of the job." [GP 1]

As well as time pressures, a lack of feedback was a factor that influenced the receptionists' collective action. One receptionist stated:

I would have liked a bit of feedback [from the GPs] with whether they felt it was successful or not...because if they don't think it's good then why would we really do it...even if it was an email to say that this is the feedback that we found...or "Thank you, receptionist, for doing a great job." [Receptionist 1]

One of the biggest facilitators of collective action was the support provided by researchers throughout the implementation period. This support was often practical, such as answering questions or reminding reception on the correct process of administering Check Up GP. As one receptionist said:

Your staff were there, so if we did have issues and it got too busy we just go "hey, come out here" and "can you help." [Receptionist 2]

As well as practical support, staff appreciated the feedback provided by researchers about the impact that using the tool was having on young people, as evidenced in improved ratings of disclosure and patient-centered care for those using Check Up GP compared with a treatment-as-usual group:

It was good to have feedback from what we're participating in...it's good to know that that was helpful. [Receptionist 3]

Reflexive Monitoring

GPs felt Check Up GP had the potential to transform the experience of care, by expanding young people's understanding of the scope of what their GP can help them with. One of the GPs said:

This very tool itself might give them the confidence to appreciate what is possible in the consultation...this is one of the truly significant advances, I think, in adolescent health. [GP 4]

While the GPs were mostly positive about the impact of using Check Up GP on their care of young people, one GP reported that there were times when he felt ill-prepared to deal with an issue raised. There was an acknowledgment from GPs that further training was needed to equip them with the skills to help patients with raised issues:

There were a few times I didn't know what to do with information...the kid who ticked "I often feel alone," okay, that's sad...it made me feel uncomfortable, that's not my kind of strength. [GP 3]

Upskilling might be useful for us to deal with specific problems...that would be a way of making it work because without the skillset in the GPs, it's all very nice but it isn't going to go anywhere. [GP 4]

GPs were able to reflect on the impact of using Check Up GP on their care of young people. One key advantage was Check Up GP provided a reason to ask for time alone when young people were attending with a parent. One of the GPs stated:

It made it easier to deal with the parents, it made it easier to throw them out of the room...It's not like, "oh, we've been talking about your presenting problem, and now I'm going to ask the parent to leave for some vague, nebulous kind of opportunistic waste of time that you don't have." It was like it forces you to do it. [GP 3]

Both receptionists and GPs observed that there was often a lack of privacy using Check Up GP for young people attending the clinic with a parent. This lack of privacy had the potential to undermine the purpose of the tool, as is evident from the following statement:

I found some of the mothers were quite intrusive. The kids were sitting there trying to do it...Like they're not going to answer something candidly, tick "Yes, I take party drugs" or "Have unprotected sex" with mum sitting on top of them, are they? So I felt that that might have influenced some of the answers to be done not honestly for the sake of offending their parents. [Receptionist 5]

Both support staff and GPs felt that the implementation improved with time, as the process became embedded:

We probably had a little bit more understanding as it went on what was happening. But I mean not that we weren't explained well enough, I think it's just getting used to doing that role. [Receptionist 3]

I think it's great. I think it does take a bit of time to get up and running with it, some months. So if you want to introduce it, you've got to be prepared to put that in. [GP 4]

For sustained use both support staff and GPs felt the tool would need to be fully integrated and automated into their clinical software. One of the GPs said:

I think because it was a trial that it didn't really worry us. I think, moving forward, I would like to see the information in the patient's file, because otherwise to then go looking, hunting for it amongst a scroll of

names is going to be really difficult...it's not going to be functional. [GP 4]

Finally, despite the implementation challenges, GPs expressed a desire to continue using Check Up GP regularly with their young patients. Indeed, when the app was removed at the end of the study one GP reflected on how it would have saved time to assess a recent patient, who presented with a psychological issue:

Certainly, the assumption is it worthwhile putting to routine [use]...it's hard to know how often you should be doing it but probably...at least [young people] being offered it every couple of years would be fabulous. [GP 1]

Another GP said:

Yes [it would have saved me time] because they're the questions I want to ask now. It would have been good if they [responses] were there and selected and she would have told me [about her] sexual health and all that. [GP 3]

Implementation Results From Young People

When asked where they completed Check Up GP, almost all (83/85, 98%) youth participants reported completing it in just one location. The majority of young people (73/87, 84%) completed Check Up GP in the waiting room, while 13% (11/87) completed it at home. Only a few completed it at work (2/87, 2%) or school/university (1/87, 1%). Of those who answered the question, 44% (35/80) of young people reported receiving an SMS from the clinic, 41% (33/80) did not receive an SMS, while 15% (15/80) could not remember. A large majority (79/85, 93%) of young people felt they had sufficient privacy completing Check Up GP, although the remaining 7% (6/85) felt they did not have enough privacy.

Discussion

Principal Findings

The aim of this study was to investigate the implementation of a codesigned health and lifestyle screening app for young people attending general practice for routine care. We conducted an in-depth implementation case study of Check Up GP, using a methodology informed by action research and NPT as a framework to guide our analysis. Overall, we found that, with appropriate time and intensive support from researchers, it is possible to implement a health and lifestyle screening app into the routine care of young people attending general practice.

One of the key challenges for GPs was the collective action, or operational work, required to implement Check Up GP. GPs expressed concern that they did not have time in routine consultations to sufficiently address all issues identified through Check Up GP, in addition to the presenting acute health issue. Given that the duration of a standard primary care consultation is approximately 10 min [51,52], this concern is understandable. There was also a concern from one GP that he did not always feel equipped to address some issues raised. Interestingly, these concerns were not reflected in young people's experience of using Check Up GP. As reported previously, the majority of

young people felt that their GP addressed the issues raised in Check Up GP either “quite a bit” or “very much [10].” It may be that young people were satisfied that any issues identified by the app were acknowledged and could be followed up in future consultations and did not expect an immediate lengthy discussion. This finding suggests that the perceptions of GPs are not necessarily reflected in the experience of patients and that patients offer important and unique insights into implementation.

Similar to GPs, support staff had high coherence and cognitive participation with the intervention, recognizing Check Up GP’s potential to improve the care of young people. However, it took time for them to normalize the administration of the app into their hectic day-to-day work routine, and improvements did not happen in a linear way, in keeping with the nature of complex interventions [16,53]. This normalization was impeded by the substantial additional time required by support staff to flag eligible patients in the clinical software, manually send individual SMSs, and then notify GPs when the tool was complete and the summary report available for viewing. Given this added work, it is not surprising that only 44% (35/80) of young people reported receiving an SMS with a link to the screening tool before arriving at the clinic. Although it was outside the scope of our study, automating this process and integrating the app within existing clinical software would facilitate implementation.

Not every issue was resolved by the end of the study. This suggests that full implementation, where the intervention is self-sustaining, was not achieved. Despite this, the implementation did improve over the 2-month study period, with youth relative usage remaining stable even as support required decreased. That full implementation was not achieved within the 2-month study period is not surprising given that successful implementation of new technology in primary care may take years [54,55]. It is also important to note that success in implementation is a dynamic and multidimensional concept, evolving over time [56,57]; so though using the app was not yet fully integrated into participants’ workflow, it was successful in terms of its acceptance, feasibility, and effectiveness.

An important facilitator for the implementation of Check Up GP, enabling collective action, was the intensive support provided by researchers onsite throughout the implementation period. Both support staff and GPs appreciated having a researcher at hand to troubleshoot issues that emerged after the clinic started using Check Up GP and to improve the implementation through rapid quality improvement cycles. This process enabled the intervention to better fit the context of a very busy primary care service where additional time to manage adoption of a new process that is a departure from usual process is slim. NPT does hold that implementation is easier when the new process blends easily with routine [24]. Dealing with these sorts of contextual issues is an important requirement in facilitating implementation in primary care [15]. Having the support of the researchers onsite meant that instead of having to pause the implementation for days or even weeks, most issues were able to be promptly investigated and resolved. Our role in facilitating the implementation of Check Up GP was, in essence, that of a practice facilitator. Practice facilitators assist primary

care practices with coordinating quality improvement activities and building capacity for those activities [58]. Practice facilitation has been shown to improve the adoption of evidence-based practices in primary care [59]. More research is needed to investigate the role of practice facilitators in helping primary care practices adopt new technology, but it does appear from our study that in very busy practices juggling competing demands, implementation is more effective if a facilitator is dedicated to the task.

Another factor that facilitated the extent of Check Up GP’s implementation was the context of our case study. The clinic did not have prior experience or systems to support the introduction of Check Up GP. However, it is likely that being located in an area of socioeconomic advantage provided greater scope for innovation compared with practices located in less-advantaged areas. As described by Hart’s Inverse Care Law [60] and supported in an analysis of Australian general practice data [61], people located in more-advantaged areas tend to receive longer consultations than those in more-disadvantaged areas, even though the frequency of care is similar. In addition, the business model of our practice may have facilitated innovation. Being a mixture of bulk billing and copayment may provide the practice with more money and time to see patients and scope to innovate compared with bulk billing only practices, which typically have very limited time and resources. Also, unlike corporate-owned practices, our clinic was privately owned by four of the practicing GPs, meaning implementation was not held up or dependent on approval of offsite management.

Strong organizational leadership and management support are important factors in the effective implementation of health technology [18,62]. Apart from the initial project orientation session run by the researchers, support staff and GPs did not manage to meet as a group to discuss implementation issues during the project. This might have been because they were expecting the researchers to manage the implementation given that was the aim of the research project. However, though support staff welcomed feedback from researchers about the impact of Check Up GP on young people’s experience of care, a number of these support staff expressed frustration at the lack of feedback and appreciation directly from the participating principal GPs. These findings suggest that there is a need for internal practice leadership to drive and support the implementation process in primary care; this is particularly important if the process is to succeed in the absence of external researchers.

Despite the challenges, GPs expressed a desire to continue using Check Up GP after the conclusion of the study. There was some discrepancy between GPs on how and when they wanted to use the tool in the future, for example, whether opportunistically in acute care as in this study or in a separate consultation. A separate appointment would be preferred by one GP, who was unwilling to run over time. Separate consultations for preventive screening may afford GPs more time but prior evidence shows low attendance of young people at dedicated preventive care well-child visits, particularly by the youth of low-income [27,28,63]. Furthermore, compared with planned well visits in the United States, dedicated to screening for health and lifestyle issues, opportunistic screening is more effective at detecting

issues in young people [64]. This suggests that integrating a screening opportunity into young people's routine acute care visits is the best way to maximize reach and detection. One option is for governments to subsidize a longer appointment to screen young people within routine consultations.

The willingness of support staff to continue to use the app sits in contrast to a previous study where receptionists developed negative views about administering a paper-based alcohol screening tool to an adult population over time [65]. A number of important methodological features in our study may have contributed to the more positive views of support staff toward continuing the implementation of Check Up GP. These features include involving support staff in iteratively improving the tool, regularly informing them about the positive impact using the tool was having on young people's experience of care, using a technology-based tool that was codesigned in part with input from support staff, and having researchers located at the clinic throughout the implementation period to troubleshoot administrative and technical issues. Given their unique and critical role and experience with this technology, support staff should be included not only in the codesign process of a tool which will affect their workflow but also in tailoring the implementation of a screening technology in primary care.

A particularly positive finding of our study was that using Check Up GP facilitated youth-friendly practice by making it easier for GPs to ask for consulting time alone with the adolescent. Having time alone with their GP is recommended as best practice for adolescent care [66], and young people who receive confidential care are more likely to discuss sensitive issues [67,68]. Despite this, the rates of young people seeing their GP alone are low [63,69]. Our findings suggest that the use of a health and screening app provides GPs with greater agency and confidence in asking for time alone and providing quality care.

Finally, our findings suggest that, not only users of a screening tool but parents attending with their child have the potential to undermine confidential care and influence the successful implementation of such a tool. Our GPs and support staff observed that many parents looked over the shoulder of their child when completing Check Up GP. This finding was reflected in the youth exit survey results where, although a minority, 7% (6/85) felt they did not have enough privacy completing Check Up GP. Privacy and confidential care is a core requirement of youth-friendly health care [70], so for a screening app to be useful and trusted it is essential that young people have sufficient privacy while using it. Future implementations of a screening tool need to ensure adequate privacy for young people, such as by providing an option of completing the app on their own smartphone, instead of a tablet, or by inviting them to use it on their own in a separate room. Another useful strategy for diverting parents' attention away from their child completing the screening tool would be giving parents their own survey to complete about any assistance they may need, an option

available through the American Academy of Pediatrics' Bright Futures Guidelines [2].

Limitations

This study had a number of limitations. We conducted a single case study, implementing the tool at one English-speaking volunteer clinic in an area of relative socioeconomic advantage with GPs who identified as being enthusiastic, knowledgeable, and confident in consulting with young people. So, it is possible that a different type of clinic, such as a community health clinic, one with a predominantly multilingual or sociodisadvantaged population, or less youth-friendly GPs, may implement and use a tool such as Check Up GP differently to the practice in this study. As such, our findings may not be generalizable.

Another limitation is that due to the relatively brief study length and limited staff availability, we were only able to conduct in-depth interviews of GPs and support staff at the end of the implementation period. Thus, our analysis provided rich insights at only one moment in time. Conducting interviews at a number of time-points through implementation may have provided further insights; however, recording the support provided to staff throughout the implementation period provided valuable insights over time.

Future Research

Although different general practices share similarities, they are diverse in a number of important ways, such as in size, location, opening hours, degree of corporatization, billing practices (free universal national health insurance versus fee for service), salaried versus nonsalaried GPs, and patient sociodemographic characteristics. Thus, further research is needed to investigate the implementation of a health and lifestyle screening tool in a range of clinics. We recommend that future projects should also ensure that the app is integrated within existing clinical software to minimize the additional work required by support staff and GPs to use this new technology.

Conclusions

The implementation of technology in time-restricted and dynamic settings such as general practice presents a range of technical and administrative challenges. Our study reveals new insights into the impact of integrating a health and lifestyle screening app into the routine care of young people on the roles and responsibilities of both GPs and support staff. We present a rich picture of the practical problems that can arise when screening tools are introduced into busy clinics and the solutions that GPs and support staff devise in response to them. Our findings will benefit future researchers and practitioners seeking to implement screening tools in real-world settings. Successful implementation of this technology is possible but requires adequate time, intensive facilitation, organizational leadership, and cycles of iteration. More resources, external to staff, are needed to drive and support sustainable technology innovation and implementation in general practice settings.

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Conflicts of Interest

None declared.

Multimedia Appendix 1

Interview schedule for interviews with general practitioners and practice support staff.

[[PDF File \(Adobe PDF File\). 20KB - mhealth_v6i4e105_app1.pdf](#)]

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Abbreviations

FTE: full time equivalent
GP: general practitioner
LGA: Local Government Area
NPT: normalization process theory
PDSA: Plan-Do-Study-Act
PM: practice manager
RC: reception coordinator
SMS: short message service

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7.3 Chapter summary

In this chapter, to address research question 4, I presented the results of Study 3b, an implementation case study that explored how a screening app for young people was integrated by GPs and practice support staff into their day-to-day work.

During a two-month implementation period the technology and administration of Check Up GP were iterated through four major quality improvement cycles in response to staff feedback and needs. This resulted in a reduction in the average time taken to complete Check Up GP from 14 minutes to 10 minutes, improved SMS text messaging for young people, and effected a more consistent description of the app by receptionists to young people. In the first weeks of implementation, support staff needed assistance with the app's administration; however, this support decreased over time, even as usage rose slightly.

This chapter concludes Part Two of my thesis. In Part Three I present a synthesis of my research findings from all three of my studies, the strengths and limitations to the research, implications for policy and practice, and suggestions for future research avenues that would build on the findings from my research.

PART THREE

8. Overall discussion

8.1 Chapter overview

This final chapter begins with a review of the aims and a discussion of the key findings of my research which addressed these aims. I then explore the implications for policy and practice and discuss the strengths and limitations of the research. Following this, suggestions for future research opportunities are identified and discussed. Finally, concluding comments are made on my research and its significance.

8.2 Synthesis of research and key findings

In adolescence and young adulthood, a range of mental health issues and risk behaviours commonly emerge. These issues and behaviours tend to co-occur (Duberstein et al., 2000) and can persist into adulthood (Sawyer et al., 2012). General practice provides an accessible and appropriate forum for health promotion and early intervention for these mental health issues and health-compromising behaviours. Although regular health and lifestyle screening of young people is recommended as best clinical practice (American Academy of Pediatrics, 2017; Royal Australian College of General Practitioners, 2012), and is acceptable to both young people and GPs (Brown & Wissow, 2009; Fothergill et al., 2013), the rate of screening young people in the general practice setting is low (Hassan et al., 2013; J. Klein & Wilson, 2002). GPs report that the major barriers to screening young people include a lack of time (Yarnall et al., 2003) and not feeling comfortable asking about sensitive issues (Henry-Reid et al., 2010). A technology-based screening tool, completed prior to the consultation, is an efficient and systematic solution to address these barriers. Technology-based screening tools are acceptable to young people and facilitate disclosure about sensitive topics (Bradford & Rickwood, 2015). They can also provide youth-appropriate

recommended advice and referrals to help GPs manage results (Bradford & Rickwood, 2015).

A growing body of research in health care settings has found that successful implementation of technology is influenced by interacting organisational, social, technical and individual factors (Cresswell & Sheikh, 2013). However, there is little research specifically investigating how technology-based screening tools should be implemented in a way that ensures that content and functionality support GP and receptionist roles, rather than adding unwanted administrative burden. There is also a need to explore whether, as well as disclosure, technology-based screening tools affect young people's experience of care and whether they want to have screening integrated into their ongoing routine care.

The aim of my research was to investigate the design, implementation, and effectiveness of a preventive screening technology intervention for eliciting health and lifestyle risks for young people attending general practice. This overarching aim is addressed through the following four research questions:

1. Does prior research suggest that health and lifestyle screening improves health outcomes for young people presenting to general practice?
2. What are the preferences of young people, general practitioners, practice support staff and parents for the design, use, and implementation of a technology-based health and lifestyle screening tool for young people in general practice?
3. Does using a health and lifestyle app affect young people's assessment of care and disclosure when attending general practice as part of routine care?
4. Can a health and lifestyle screening app for young people be successfully implemented in a general practice setting?

To answer these research questions I conducted three studies: a systematic review of the literature (Chapter 4) which provided an understanding of the need and a

rationale for developing a health and lifestyle screening tool for young people attending general practice; a series of co-design workshops (Chapter 5) to identify and explore user and stakeholder design and implementation requirements of a technology-based screening tool for young people in general practice; and, a mixed methods effectiveness-implementation case study that investigated both young people's experience of care when using a screening app as part of their routine care (Chapter 6), and the implementation of the app in a general practice setting (Chapter 7). Below, I discuss the main findings of the three studies in this thesis in relation to the research aim and questions listed above. While there is some repetition in this first section from the discussions in the published papers (Chapters 4-7), I feel this is necessary to inform the reader about where the overall discussion is heading.

8.2.1 Impact of screening and intervening for health and lifestyle on health outcomes

The first study of my research, described in Chapter 4, was a systematic literature review that investigated whether screening young people for multiple health-compromising behaviours and mental health disorders in primary care leads to better health outcomes. Using the Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) guidelines (Moher et al., 2009), I systematically reviewed nine journal articles and found that seven studies, including two Randomised Control Trials (RCT) and one clustered RCT, reported positive changes in substance use, diet, sexual health or risky sexual behaviour, alcohol-related risky behaviour, social stress, stress management, helmet use, sleep, and exercise. Thus, I found that there was evidence to suggest that screening young people can lead to improved health outcomes. These findings support the recommendation of regular preventive screening of adolescents by peak medical bodies, including the Royal Australian College of General Practitioners (Royal Australian College of General Practitioners, 2012) in Australia and Bright Futures (American Academy of Pediatrics, 2017) in the United States.

This systematic review also extends two previous systematic reviews that investigated the health outcomes of screening and preventive interventions of young people. In their review of clinical trials in 2004, Moyer and Butler found limited evidence to support screening and preventive interventions, recommending more rigorous research to support guidelines from professional health organisations for preventive care of young people (Moyer & Butler, 2004). However, Moyer and Butler's study did not look at screening multiple behaviours nor did they include young adults aged over 21 years of age. In addition, as seven of the nine studies in my study were published after Moyer's systematic review, my systematic review was a timely and needed review of the evidence.

Hale and colleagues previously found that risk prevention interventions for young people can be effective when targeting multiple health risk behaviours (Hale et al., 2014). The studies in Hale's systematic review were conducted predominantly in school settings and, unlike my systematic review, none were conducted in general practice (or primary care) settings. Thus, the findings of my systematic review provide new knowledge about the potential of screening to improve young people's health outcomes.

The systematic review highlighted two important gaps in the literature. Firstly, while the study by Sanci and colleagues found improvements to some health outcomes, defined as reducing risk taking behaviours, in young people after using a paper-based screening tool or discussion according to the HEEADSSS framework, they also found that each risk was discussed at best in only 30% of consultations (Sanci et al., 2015). There is a research gap in understanding how to facilitate the systematic and comprehensive discussion of health risk and protective factors (screening) with young people. In addition, previous research has shown barriers to discussing all screening results, which include a lack of knowledge in both how to manage positive results (Van Hook et al., 2007) and how to discuss sensitive issues (Henry-Reid et al., 2010). Screening-based technology tools have the potential to address these barriers, by systematically guiding young people through the screening questions and providing GPs a report that guides the

discussion, including suggested actions and referrals based on identified issues. Secondly, although my systematic review included technology-based screening tools, there was limited information provided about how these tools were developed and designed, and whether end-users were consulted or involved in the design of the tool's content and functionality. Involving end-users in the design of technology ensures that the tool meets users' needs and is contextually relevant (Clemensen et al., 2007). The findings of my subsequent two studies addressed these gaps, which I discuss below.

8.2.2 Design requirements for the successful implementation of a health and lifestyle technology-based screening tool for young people attending general practice

The second study I conducted was a series of co-design workshops and interviews. This study investigated the design and implementation requirements for an opportunistic technology-based health and lifestyle screening tool for young people attending general practice as part of their routine care. I conducted two co-design workshops with young people: one with those aged 14 to 17 years and one with those aged 18 to 25 years. Next, I held a co-design workshop with GPs, to understand how a technology-based screening tool could be designed in such a way as to enable them to integrate it within the time constraints of their routine clinical care. Following this workshop, I interviewed 11 receptionists and practice managers from a range of practices across Melbourne. Understanding the features needed to integrate the tool within the day-to-day demands of receptionists' work was an important objective of these interviews. Finally, I conducted a co-design workshop with parents of young people. Although not actual users of the screening tool, many parents are still closely involved in the health care of their adolescent children and have the potential to be gatekeepers of their child's use of the screening tool, particularly for younger adolescents still attending general practice with their parent.

While participants agreed on the purpose and potential benefits of a technology-based screening tool for young people attending general practice, they also identified incompatible design requirements. For example, while GPs did not want to read through a lot of information on the summary report, preferring a format that would allow them to quickly scan and analyse the content, young people were keen to provide more detail, to convey the complexities of their life. In addition, GPs expressed a preference to have the tool completed in the waiting room to minimise any medico-legal concerns about an asynchronous GP-response to a serious risk highlighted in the screening tool, while young people expressed a preference to have the flexibility to complete the tool in their own space and time, on their own device, before attending the clinic. The clinician's concerns about the timely response to risks raised outside consultation was also identified in a recently published co-design study of an app for youth mood self-monitoring and communication with clinicians (Hetrick et al., 2018), highlighting the importance of health technology to not only be usable and effective, but to also meet minimal acceptable levels of risk and security.

Parents had mixed feelings regarding the screening tool. They recognised the benefits and need for young people to complete a screening tool in privacy. However, they also wanted to know if there were any issues going on for their child, to ensure that the appropriate support and follow-up would be provided. In the end, trust in the doctor, and the function and role of the tool, was identified as particularly important for parents to allow their child to use the tool. These findings support previous research that found that parents' views about confidentiality are complex (Duncan, Vandeleur, Derks, & Sawyer, 2011) and that trust in the GP is associated with parents' acceptance of their child's confidential health care (Sasse, Aroni, Sawyer, & Duncan, 2013). I discuss potential areas of future research with parents later in this chapter.

The findings from my second study illustrate that co-design can help solve the complex and conflicting requirements that different stakeholders bring to the design of technology interventions for young people. They support a growing body

of research showing how co-design with young patients and clinicians provide important and unique design requirements for health technology and services for young people (Hetrick et al., 2018; Orlowski et al., 2015; Wadley et al., 2013; Whitehouse et al., 2013). As such, as a result of this co-design study, I was able to develop a mobile-based solution ('Check Up GP' app) that was best placed to meet the needs of all parties when implemented in the real-world context.

8.2.3 Effect of using a health and lifestyle screening app on young people's assessment of care

Directly informed by these co-design workshops, my third and final study was a hybrid effectiveness-implementation case study, conducted in one general practice clinic in an inner urban suburb of Melbourne, Australia. As discussed in Chapter 6, I investigated how using a screening app ('Check Up GP'), influenced young people's assessment of the quality of their care and their disclosure of sensitive issues. I also explored young people's experience and willingness to use the app as part of their routine care. To do so, I compared exit surveys of 30 young people in a one-month treatment-as-usual phase with 85 young people in a two-month intervention phase, where young people completed Check Up GP prior to attending the clinic as part of their routine care. I followed this up with semi-structured interviews with 14 young people from the intervention group.

I found that using Check Up GP was associated with improvements in disclosure. Compared to the treatment-as-usual group, young people using Check Up GP had greater disclosure across all health and lifestyle domains, including sexual health and drug use, except for physical health where disclosure was already high. Previous research has found that screening via technology increases disclosure compared with paper (Gnambs & Kaspar, 2015; Spark et al., 2015) and face-to-face (Bradford & Rickwood, 2015) formats, as well as increasing disclosure for individual health issues, such as violence (Riese, Mello, Baird, Steele, & Ranney, 2015), drug use (Wang et al., 2005), and mental health issues (Staeheli, Aseltine, Schilling, Anderson, & Gould, 2017). My findings extend this research by being, to my knowledge, the first study in a general practice setting investigating young

people's disclosure of using a technology-based screening tool for multiple health and lifestyle issues.

In addition to increasing disclosure, using Check Up GP increased young people's ratings of patient-centred care. Patient-centred care has a focus on communication, partnership and health promotion in the doctor-patient consultation (Little et al., 2001b). This approach to care has been identified by the National Academy of Medicine, a peak health research and policy body in the United States, as one of six core needs to drive the improvement of health care (Institute of Medicine, 2001). Although patient-centred care has been associated with improved symptom burden, satisfaction and enablement (Little et al., 2001a) and young people report they prefer a patient-centred approach (Alden et al., 2012), only 53% of young people report receiving this type of care in primary care (Toomey et al., 2016). Further, while previous research has found that technology-based screening improves patient-centred care in adults (Krist et al., 2016) and parents of children aged 4 to 10 years (Fothergill et al., 2013), there has been limited research investigating the impact of technology-based screening on young people's patient-centred care.

In my final study I found that young people using Check Up GP had higher ratings in four of five areas of patient-centred care: communication and partnership, personal relationships, health promotion and interest in the effect of the problem on life. Although approaching significance ($P=.06$), I found no change in young people's ratings of positive and clear approach to the problem, perhaps reflecting that the GPs participating in my study were already reasonably proficient in this area. The improvement in communication and partnership is particularly encouraging, given patient partnership with the clinician is identified as one of 10 building blocks of high-functioning primary care services (Bodenheimer, Ghorob, Willard-Grace, & Grumbach, 2014). My findings are in contrast with a previous study by Gadomski and colleagues that found no change in partnership or rapport for young people using a technology-based screening tool (Gadomski et al., 2015), however this difference may reflect that their study measured patient-centre care

via the analysis of audio recordings rather than young people's own ratings. My findings are also in contrast to a study by Thompson and colleagues that found no changes in communication and experience of care, or in health information provided (Thompson et al., 2016). Both these studies were limited by being conducted with young people at well visits in the United States, which are not well-attended by key subgroups of young people such as those of low-income and uninsured (Irwin et al., 2009), and only with adolescents aged 14 to 19, thus not necessarily representative of all young people. My findings extend the findings of a study by Olson and colleagues that found young people using a technology-based screening tool were more likely to feel that they were listened to carefully (Olson et al., 2009). As well as improvement to communication, young people using Check Up GP reported improvements in the other core patient-centred care elements of personal relationships, health promotion, and interest in effect of problem on life. Improving patient experience has been identified as one of three key goals in the Triple Aim framework, along with reducing costs and improving the health of the population, to optimise health system performance (Berwick, Nolan, & Whittington, 2008). These findings provide important new knowledge about the potential of technology to improve patient-centred care and patient experience for young people in general practice.

Young people liked that completing Check Up GP gave them something to do in the waiting room and gave them time to reflect on their responses and prepare for what would be discussed in the consultation. This supports findings in previous research with young people attending a school-based youth health clinic (Goodyear-Smith et al., 2016). Given young people's willingness to engage with a screening tool in the waiting room, there may also be scope to deliver personalised brief interventions or health promotion prior to the consultation. Indeed, a review of the literature has found that passive interventions in primary care waiting rooms, not requiring the direct involvement of other people, are effective in promoting healthy lifestyle behaviours (Cass, Ball, & Leveritt, 2016). More research is needed to explore the effect of these waiting room interventions on young people's health behaviour and outcomes.

One unexpected finding was that, although overall disclosure increased, young people also admitted they had lied on some questions, or not disclosed the full extent of the behaviour or issue. In the qualitative interviews young people reported that they would be more likely to lie if they were uncomfortable discussing an issue or they did not feel like the problem was affecting their health. Given the purpose of the app was to facilitate disclosure, I initially found this result surprising and a little disappointing. However, on reflection, it may be that this tool provided young people with an opportunity to ‘dip their toe in the water’, to test what the reaction of their GP would be to a sensitive or embarrassing issue they had never raised previously. Alternatively, they may simply not have been ready to talk about it or ready to change. Despite this, my findings suggest that even just using the app may have benefits, by increasing their knowledge about the scope of health and lifestyle issues they can talk to their GP about for the next time when they are ready to talk about these health issues.

8.2.4 Implementation of a health and lifestyle screening app for young people in general practice

The second part of the effectiveness-implementation study was an in-depth implementation case study, using methodology informed by action research and Normalisation Process Theory (May & Finch, 2009; Murray et al., 2010), to explore how the screening app was integrated by GPs and practice support staff into their day-to-day work. A Plan-Do-Study-Act framework (Langley et al., 1996) was used to help the clinic structure the iterative improvement of Check Up GP and its administration in rapid quality improvement cycles. The four GP principal owners and all ten practice support staff participated in the study, with all except three receptionists participating in the final interviews and focus groups. During the two-month implementation period the technology and administration of Check Up GP was iterated through four major quality improvement cycles in response to staff feedback and needs.

I found that both GPs and practice support staff had strong coherence about the intervention; they had a good understanding of the benefits and purpose of the

app. All staff were able to reflect on the value of the app to young people, while GPs valued the additional knowledge and framework it provided about their patients. For some support staff there was a notable shift over time in their competency in administering the app, illustrated by the steady decline of support required over the implementation period for staff relative to the number of eligible patients. This highlights the importance of research that explores staff experience over time, rather than only immediately after a technology is introduced in the work setting.

In addition, a lack of time also impacted staff capacity for implementation. For example, apart from an initial orientation meeting about the study, it was not possible to get all doctors and all support staff together to talk about the study at the one time and place despite the agreement by participants to do so. This finding reflects those of a meta-review of implementation of technology in general practice that found organisational factors, including allocating additional time to implementation, are key to facilitating successful implementation of technology in general practice (Cresswell & Sheikh, 2013). The lack of ongoing implementation work in this study may reflect the organisational culture of this particular clinic, or perhaps was an artefact of being part of a study, which was reliant on my presence for app use. Perhaps the point at which I withdrew was still too early for the practice to feel it could take full ownership of the screening tool, especially as there were ongoing requests for modification to the app, such as integration with practice software.

That not every issue was resolved by the end of the final study suggests that implementation was incomplete. The Stages of Implementation Completion is an observation-based measure that posits effective implementation is achieved through eight key milestones or stages: 1. engagement; 2. consideration of feasibility; 3. readiness planning; 4. staff hired and trained; 5. adherence monitoring processes in place; 6. services and consultation begin; 7. ongoing services, consultation, fidelity monitoring and feedback; and 8. competency (Chamberlain, Brown, & Saldana, 2011). According to this model, at the end of the study, , given there was unresolved issues, the implementation of Check Up GP was

in the seventh stage, with further fidelity monitoring and feedback required. Stages one to seven were evident in the improvement of implementation over the 2-month study period, such that youth relative usage remained stable with the implementation support required from researchers decreasing over that time. In the NPT framework, stage 8 is described as the sustainable integration on an intervention as routine practice (Murray et al., 2010). That full implementation was not achieved within the 2-month study period is not surprising given that successful implementation of new technology in primary care may take years (Fleming, Culler, McCorkle, Becker, & Ballard, 2011; Hacker, Penfold, Zhang, & Soumerai, 2012). It is also important to note that success in implementation is a dynamic and multidimensional concept, evolving over time (Berg, 2001; Proctor et al., 2009); so though using the app was not yet fully integrated into the clinic's workflow, the results from my study suggest it was successful in terms of its acceptance, feasibility, and effectiveness.

Perhaps the biggest barrier for receptionists was the collective action, or operational work, required to administer Check Up GP. For example, as Check Up GP was not integrated into the existing clinical software, substantial additional work for the receptionist's co-ordinator, who was solely responsible for manually sending each individual SMS daily, was required. Indeed, this finding supports those of a study of the implementation of a technology-based screening tool for an adult population in a cancer care centre that found the additional work was one of the biggest barriers for staff (Clark et al., 2009). Despite the additional work, there was a willingness of support staff to continue to use the app, which is in contrast to a previous study where receptionists developed negative views about administering a paper-based alcohol screening tool to an adult population over time (Lock, Kaner, Heather, Gilvarry, & McAvoy, 2000). A number of important methodological features in our study may have contributed to the more positive views of support staff toward continuing the implementation of Check Up GP. These features include involving support staff in iteratively improving the tool, regularly informing them about the positive impact using the tool was having on young people's experience of care, using a technology-based tool that was co-

designed with input from support staff, and having researchers located at the clinic throughout the implementation period to troubleshoot administrative and technical issues. Given their unique and critical role and experience with this technology, support staff should be included not only in the co-design process of a tool which will affect their workflow but also in tailoring the implementation of a screening technology in primary care.

One of the benefits identified by participating GPs in the final study was that Check Up GP facilitated disclosure, particularly about sensitive issues, and gave them a deeper understanding their young patients' lives. This finding supports previous studies in youth and school clinics where clinicians reported a technology-based screening tool assisted them by identifying problems that they would not have identified in a normal consult (Darling-Fisher et al., 2014; Goodyear-Smith et al., 2016).

A particularly positive finding of our study was that using Check Up GP facilitated youth-friendly practice by making it easier for GPs to ask for consulting time alone with the adolescent. Having time alone with their GP is recommended as best practice for adolescent care (Ford, English, & Sigman, 2004), and young people who receive confidential care are more likely to discuss sensitive issues (Fairbrother et al., 2005; Gilbert, Rickert, & Aalsma, 2014). Despite this, the rates of young people seeing their GP alone are low (Edman, Adams, Park, & Irwin, 2010; Irwin et al., 2009). My findings suggest that the use of a health and screening app provides GPs with greater agency and confidence in asking for time alone and providing quality care.

During the implementation study there was a high level of non-participation by young people (124/209, 59%). Of those, a minority (14%, 30/209) said they did not want to use Check Up GP, however, unfortunately, we did not obtain any information about why they did not want to use it. This proportion is similar to that of another study that reported 13% of young people declining to use technology-based screening tools for health and lifestyle issues before a mental health consultation, although this study also did not report a reason for declining

(Bradford & Rickwood, 2015). It may have been that the young people who declined to use Check Up GP didn't understand what was required, that they felt uncomfortable or embarrassed, or were worried about the privacy of their responses. Alternatively, they may have assumed the app was not part of their clinical care, but a type of feedback form for a separate research study unrelated to the care they were about to receive. The impact of parents may have also been a factor; it may have been that parents were declining on behalf of their child without giving the young person the opportunity to decide for themselves. Further research is needed to understand the reasons why young people may not want to use a screening tool.

Regardless of how well a technology is designed prior to implementation, it is reasonable to expect that there will be issues that emerge only when it is used in a real-world setting. Technology introduced into the complex primary care setting needs to be flexible and adaptable to the needs of the clinic and the GP. For example, some clinics may not want to SMS a link to Check Up GP to patients at the time of making an appointment, while others may not have software with this capability or simply prefer not to use this feature. Further, these needs may change over time, depending on the changing needs and preferences of the GPs, practice support staff and young people. This iterative approach to design and development is common to engineering and computer science fields, and is now increasingly recognised as critical for technology implementation in complex health care settings (Cresswell & Sheikh, 2013).

8.3 Implications for policy and practice

8.3.1 Supporting technology development and implementation for general practice

In Australia, a positive step in ensuring health technology meets the needs of all stakeholders and users has been the release of National Digital Health Strategy by the Australian Digital Health Agency (Australian Digital Health Agency, 2017). This Strategy identifies the ongoing use of collaborative, co-design and co-production

principles as key to the successful implementation of technology. The Strategy also includes the establishment of “test-beds”, where technology will be tested, refined and evaluated in real-world environments. The findings of my research support the need for and utility of iterating and evaluating technology in real-world settings, demonstrated by the improvements made to the app and its administration during the implementation phase. My findings also highlight the importance and positive impact of the meaningful involvement of all users and stakeholders for the effective and sustainable use and implementation of health technology.

Another positive development to support technology use in the general practice setting has been the release by the Royal Australian College of General Practitioners (RACGP) of a range of practical guidelines and online training to support general practices to use health technology. As well as information about the My Health Record, the Australian government’s cloud-based electronic health record system to enable patient medical information to be shared securely, the content of this training and guidelines covers telehealth, social media, and computer information security standards. There is also a comprehensive ‘mHealth in general practice’ toolkit that provides detailed information and instructions for GPs about how to incorporate mobile technologies for health into general practice (Royal Australian College of General Practitioners, 2016).

However, despite these positive developments, the findings from my studies suggest that more research might be required to understand how to best engage general practice staff in quality improvement activities. For instance, although the RACGP best practice guidelines provide a framework that includes assigning leadership roles, it may be unrealistic to expect that general practices will have sufficient ongoing time, staff or expertise to support the integration of new technology. Even though Practice Managers are generally responsible for introducing new systems and practices as part of their role, their capacity to lead technology implementation may be limited, given their already hectic roles where

they are responsible for the day-to-day management of other staff and the management of the clinic.

Given this lack of existing resources, and evidenced by the initial reliance on researchers to facilitate the implementation of Check Up GP in my implementation study, there is a need and potential for additional staff to drive and support technology implementation in general practice. This would operationalise existing educational material developed by the RACGP. One option that utilises existing infrastructure is for Primary Health Networks (PHNs) to provide this role. PHNs were established by the Australian Government in 2015 with the aim to support primary care practices in their local communities to increase efficiency and effectiveness of medical services to patients, particularly those at risk of poor outcomes, and to improve the coordination of care (Australian Government Department of Health, 2016).

Electronic health technology ('ehealth') is one of six top priority areas identified by the Australian Government for targeted work by PHNs, along with mental health, Aboriginal and Torres Strait Islander health, population health, health workforce, and aged care. This suggests that it is within the PHNs' scope of practice to support the ongoing introduction of innovative, effective and engaging patient-centred health technology. The PHNs could incorporate 'hands-on' support of the implementation of new technologies into their existing support of practices, adopting a similar role to that which I did in this study; working closely with the clinic to encourage and support technology use, trouble-shooting issues as they arise, feeding back data, encouraging and advocating. Indeed, PHNs have an established model that could be utilised; quality improvement collaboratives. A quality improvement collaborative "brings together groups of practitioners from different health care organisations to work in a structured way to improve one aspect of the quality of their service" (Ovretveit, 2002).

In the United States, the Institute of Healthcare Improvement has reported collaboratives can improve key indicators on quality care, including reducing waiting times and reducing hospitalisations for patients with congestive heart

failure (Institute for Healthcare Improvement, 2003). In Australia, quality improvement collaboratives in general practice have been funded by the Department of Health through the Australian Primary Care Collaboratives Program. However, the evidence for the effectiveness of these collaboratives is limited and mixed, possibly due to challenges in collecting validated data, and while a number of studies have shown some improvements to health outcomes (AKnight, Caesar, Ford, Coughlin, & Frick, 2012; Knight, Ford, Audehm, Colagiuri, & Best, 2012), others have found no significant improvements to care or outcomes (Blackberry et al., 2013; AKnight, Szucs, Dhillon, Lembke, & Mitchell, 2014). More research is needed to understand if the quality improvement collaborative methodology is suitable and effective for the implementation of technology in general practice settings.

8.3.2 Integrating patient-generated data into general practice consultations and clinical software

In Australia, young people have near universal Internet access (Australian Bureau of Statistics, 2016b). With more affordable and sophisticated portable devices, such as smartphones and tablets, there has also been an associated explosion of free or low-cost user-centred apps available to run off these platforms. Reflecting technology's ubiquity in their lives, young people are interested in using apps to monitor and track aspects of their health, with 21% having downloaded a health-related app (Wartella et al., 2016). My research found high acceptability from young people to integrate screening app data into their health care. I also found that using the app led to significant improvements in patient-centred care, supporting and extending previous research (Gadomski et al., 2015; Olson et al., 2009).

Despite the potential to enhance and enrich care, my research also found that a lack of interoperability was a key barrier for GPs and practice support staff for the ongoing use of Check Up GP. Interoperability is defined by Hammond and colleagues as “the ability to communicate and exchange data between different IT (Information Technology) systems, software applications, and networks”

(Hammond, Bailey, Boucher, Spohr, & Whitaker, 2010). Interoperability is essential for the creation of a health system that allows service providers and patients to easily share and use health information in real time. For example, in my study the ability of Check Up GP to send young people's data automatically into GPs' clinical software was identified by GPs as a requirement for future ongoing use.

There are multiple and complex challenges for creating an interoperable health IT system. Major challenges include establishing data and clinical terminology standards, and unique person identifiers (Hammond et al., 2010). In the Australian context, although the My Health Record system has the ability to integrate third party apps, the current complexity of the system makes it difficult and unappealing for developers (Bidargaddi, van Kasteren, Musiat, & Kidd, 2018), thus the system remains limited in its functionality. However, as is increasingly the case for clinical software, that My Health Record is accessible via the Internet ('cloud'), rather than located only on local servers, has the potential to accelerate interoperability by allowing updates and enhancements, such as the ability to integrate third party apps, to be quickly and regularly integrated.

A current innovation under trial which may in the future, if proven effective, support the shift to a more integrated digital environment is Project Synergy. The Australian Government's Department of Health has invested AUD\$30 million into supporting Project Synergy (<https://www.innowell.org/project-synergy>); a new e-mental health ecosystem developed by Innowell, a joint venture between the University of Sydney and Price Waterhouse Coopers, a global professional services firm. Synergy aims to facilitate interoperability by providing a seamless experience of mental health services for young people, giving them the ability to transfer information within and between online and offline and face-to-face services. Currently being trialled at three sites in New South Wales, Synergy's focus is on mental health and does not include general practice. However, given that most young people regularly attend general practice and do not usually seek

professional help elsewhere, there is a need to examine the potential of such fully online health eco-systems in the general practice setting.

8.3.3 Improved guidelines for screening adolescents in Australia

In the United States the American Academy of Pediatrics, through their Bright Futures Guidelines, recommend that adolescents are screened annually for psychosocial and behavioural issues, drug use, depression, sexually transmitted infections and body mass index (American Academy of Pediatrics, 2017). In Australia, the RACGP, the peak professional body for GPs, recommends screening young people regularly for a range of physical and psychosocial issues. However, the RACGP's recommended frequency of this screening varies depending on the issue; screening is recommended at every visit for depression, suicide and nutrition, every two years for exercise, smoking and body mass index, and opportunistically for violence and tobacco use (Royal Australian College of General Practitioners, 2012).

In contrast to these RACGP guidelines, results from my third study found that of those young people who wanted to use Check Up GP again (63/85, 74%), almost all (59/62, 95%) wanted to use it at least once a year or every time they saw their GP. This suggests that a well-designed technology facilitates acceptability and feasibility. The qualitative interviews support these findings; for young people changes in their physical and psychosocial situation can happen often. Based on these findings, and reflecting those of the American Academy of Pediatrics, the RACGP guidelines could be updated so that it is recommended that all young people are screened annually for all physical and psychosocial issues. As well as reflecting young people's wishes and international guidelines, annual psychosocial screening would have the advantage of providing a standardised screening schedule for GPs, which would be easier to follow and implement.

8.3.4 Financial incentives for screening young people and for technology implementation

As outlined in Chapter 2, the Australian Government's Medicare (free universal

health care) system subsidises a range of services provided during consultations in general practice through the Medicare Benefits Schedule (MBS). The MBS currently includes preventative services targeted to the following populations: Aboriginal and Torres Strait Islanders, people aged 45 to 49 at risk of developing a chronic illness or Type 2 diabetes, people aged 75 and older, permanent residents of aged care facilities, those with an intellectual disability and refugees. There is evidence that these assessments facilitate the identification of issues (Thomas et al., 2014), and lead to short-term improvements in patient behaviour and readiness to change (Amoroso, Harris, & Mckenzie, 2009).

The findings of my research support the potential utility and need for an MBS item for annual screening and preventative health for young people in general practice. Even though completing a screening tool immediately before the consultation may initially save time for GPs, by not having to ask a long series of questions and through the automated identification of issues of concern, GPs in my study expressed concern that they did not have time in routine consultations to sufficiently address all issues identified through Check Up GP in addition to the presenting acute health issue. Given that the average duration of a general practice consultations in Australia is approximately 15 minutes (Britt et al., 2016) this concern is understandable. A dedicated MBS item for preventative health for young people would allow flexibility for GPs to screen young people at their routine consultation and then, depending on the preference of the doctor and patient, either address the issues immediately or organise a separate appointment.

Alternatively, as it is within their existing scope of practice for general practice nurses in Australia to conduct health assessments, an MBS item may allow practice nurses to conduct an initial health screening, before a follow-up assessment and intervention from the GP as needed. It may also be more realistic for nurses to have more time to discuss results at length with young people. Although involving nurses was outside the scope of my research, previous studies of paper-based screening tools that included nurses found an increase in the identification and discussion about health issues (Golsater, Sidenvall, Lingfors, & Enskar, 2011; Sanci

et al., 2015), suggesting either GPs or nurses would be acceptable to young people for routine screening.

My findings suggest that for screening young people to be successfully taken up in general practice, there is a need for sufficient time for the screening implementation to be iterated to the needs of participants and setting. A need for implementation support and time to embed processes is supported by a number of Australian studies that found the uptake of MBS assessments has been slow, particularly when initially introduced (Alexander & Mazza, 2015; Hamirudin, Ghosh, Charlton, Bonney, & Walton, 2015). An alternative to an MBS item, that could drive the implementation of screening technology and the delivery of best clinical practice in general practice, is the Practice Incentives Program (PIP). The PIP is a financial incentive ('pay-for-performance') offered by the Department of Health in Australia to support improved care, capacity, access, and health outcomes. In the 1990s, PIP activities were successfully used in Australia to incentivise the now ubiquitous use of computers and clinical software for prescribing and for transmission of clinical data (Dwan, Western, Del Mar, Western, & Makkai, 2003). Currently, the PIP activities include the cervical screening incentive, diabetes incentive, and the eHealth incentive. The eHealth PIP supports the uptake of secure digital messaging, the electronic transfer of prescriptions, and the uploading of shared health summaries to the government's My Health Record system. However, the scope of this eHealth PIP could be expanded to encourage and support other innovative and sophisticated uses of technology to drive best clinical practice, including using and integrating technology-based screening tools into the routine care of young people.

There is sound evidence to support the use of financial incentives to drive quality improvement in healthcare settings. A cluster randomised control trial found that pay-for-performance was a cost-effective strategy to improve evidence-based treatment for adolescent substance disorders (Garner, Lwin, Strickler, Hunter, & Shepard, 2018). In addition, a systematic review of the international literature on pay-for-performance found that the largest improvements were in areas where the

baseline performance was poor (Mendelson et al., 2017). Given the current rates of health and lifestyle screening of young people are particularly low (Burstein et al., 2003; Hassan et al., 2013; Klein & Wilson, 2002; Ozer et al., 2009), an MBS or PIP item for screening and preventive services for young people in Australia, along with an implementation strategy, could be effective in driving this best clinical practice and higher uptake of technology into primary care. More research is needed to investigate the potential of financial incentives to increase screening and technology implementation in general practice.

8.4 Strengths and limitations of my research

8.4.1 Strengths

Overall, a major strength of my research was the co-design and iterative approach to the design, development, and implementation of a health technology for general practice. This approach ensured important learnings could be integrated within and between studies. For example, the co-design approach enabled practice support staff (receptionists and practice managers) and GPs to have direct input into improving the design and implementation of Check Up GP as they were using it. This process led to a range of key administration and technology improvements to Check Up GP, which I found resulted in improved implementation that participants could benefit from as they continued to use the app.

Another strength of my research was that it included young adults aged 18 to 25 years. As described in Chapter 2 of this thesis, young adults aged 18 to 25 have a higher prevalence of serious psychological distress and substance use compared to younger adolescents aged 12 to 17 and adults aged 26 to 34 (Neinstein, 2013; Stroud et al., 2015). This young adult population is also more likely to report not having a regular doctor and having a weaker sense of belonging to a local community, likely due to social isolation and to work and study commitments, compared to other age groups (Marshall, 2011). Despite this, as I found in my systematic review, few studies of health and lifestyle screening tools in general practice had included young adults as participants.

The strong theoretical underpinnings of my studies were also a strength of my research. I used a co-design framework for both the design workshops (Study 2) and my mixed methods effectiveness-implementation case study (Study 3). The involvement of users and stakeholders throughout the design and implementation process ensured that Check Up GP met their needs and was acceptable. This co-design approach also had the benefit of involving parents and practice support staff, cohorts who have previously been under-represented in the co-design of health technology for young people (Orlowski et al., 2015). As well as a co-design framework, Normalisation Process Theory (NPT) (May & Finch, 2009; Murray et al., 2010) was used to guide the interview schedules and data analysis. As argued in Chapter 3, NPT is a particularly appropriate theoretical lens for my research because it provides a causal explanation of implementation (Nilsen, 2015), accounts for the important social aspects of its implementation previously neglected in the published literature (Mair et al., 2012), and has been widely used as an evaluation framework in the implementation of screening tools in the primary health setting (Chiang et al., 2015; Hooker et al., 2015; Ricketts et al., 2016). The quality of my research was further enhanced by the use of the PRISMA reporting guidelines for my systematic review (Moher et al., 2009).

8.4.2 Limitations

As well as strengths, there are also several limitations to the study. Primarily, the research site of my case study may not have been representative of all clinics. As identified by Lau and colleagues, organisational and professional factors, such as attitudes to change and skills mix, are key elements influencing implementation of change in primary care (Lau et al., 2016). For example, in my study GPs were generally positive about their experience of using Check Up GP, despite the challenges, and by their own estimation the GPs were youth-friendly and motivated to trial the technology. Unlike previous studies that have suggested that GPs do not address all issues raised in a screening tool (Bradford & Rickwood, 2012), the GPs reported that they made an effort to address young people's responses, even if there were not high risk items. In addition, the GPs and

reception staff for both the participatory design workshops and in the case study were recruited by the Victorian Primary Care Practice-Based Research Network (VicReN) at the University of Melbourne in Australia. It is likely that members of VicReN population are particularly engaged and motivated to participate in research and quality improvement programs, so they may not be representative of GPs or clinic settings, either in their patient characteristics or their organisational culture.

There may have been characteristics that are only applicable to general practice clinics located in the area of Melbourne where the final study took place or to the Australian general practice context. It is also likely that being located in an area of socioeconomic advantage provided greater scope for innovation compared with practices located in less-advantaged areas. As described by Hart's Inverse Care Law (Hart, 1971) and supported in an analysis of Australian general practice data (Furler et al., 2002), people located in more-advantaged areas tend to receive longer consultations than those in more-disadvantaged areas, even though the frequency of care is similar. In addition, the business model of our practice may have facilitated innovation. Being a mixture of bulk billing and co-payment may provide the practice with more money and time to see patients and scope to innovate compared with bulk billing only practices, which typically have very limited time and resources. Also, unlike corporate-owned practices, my clinic was privately owned by four of the practicing GPs, meaning implementation was not held up or dependent on the approval of offsite management.

Another limitation is that due to the relatively brief length, and limited staff availability in the final study, I was only able to conduct in-depth interviews with GPs and support staff at the end of the implementation period. Thus, although my analysis provided rich insights from participant interviews at only one moment in time, conducting interviews at a number of time-points throughout implementation may have provided further insights. However, this limitation is mitigated by my mixed methods design which allowed for triangulation of qualitative and quantitative data over time. By tracking the rates of patient usage

and support provided to staff by myself or research assistants across the implementation period, I was able to calculate that the proportion of support that in-practice researchers provided practice staff to administer Check Up GP declined over time. In addition, the PDSA quality improvement cycles reflected the evolving needs of the GPs and support staff to better integrate Check Up GP throughout the implementation period.

A final limitation of my research is that it did not include adolescents aged 10 to 13 years. As discussed in Chapter 2, the age range 10 to 14 years has been identified as early adolescence, a distinct developmental period for young people which typically includes the beginning of puberty, growth in capacity of abstract thought and interest in sex, and an increasing influence by peer group (Sawyer et al., 2012). Although alcohol use, unsafe sex and iron deficiency are leading risk factors contributing to the disease burden in early adolescence (Gore et al., 2011), there has been a paucity of research with this cohort of young people and thus a need for early adolescent interventions to prevent risky behaviours and longer-term ill health (Blum, Astone, Decker, & Mouli, 2014). In addition, given half of adult mental health issues emerge by 14 years (Kessler et al., 2005), there is a need to research how this technology might detect those developing or at risk of developing mental health issues.

8.5 Future research

Conducting this effectiveness-implementation in-depth case study in one clinic had the advantage of allowing a comprehensive exploration and analysis of the facilitators and challenges of implementing a health and lifestyle screening app for young people in general practice. However, there is a need to conduct a larger trial with a more diverse and representative sample. This would involve the inclusion of clinics located in a range of socio-economic areas, and participants with diverse cultural backgrounds, using an app with content available in multiple languages. It would also include clinics where young patients did not have an existing relationship with the GP, as did most of the young people in my study, with 80% (24/30) in the TAU group and 86% (73/85) in the implementation group

reporting it was not their first time seeing that doctor. A larger trial would take the form of a cluster RCT with practices randomised to either using the app or not using the app as part of young people's routine care, to investigate whether similar improvements to those that I found in young people's disclosure and patient-centred care are supported, and whether these improvements persist and deepen over subsequent consultations with GPs.

Further research is also needed to understand the longer-term effect of using Check Up GP on young people's engagement with care and their health behaviour and outcomes. In particular, this research could investigate whether the process of using the app and having a subsequent discussion with their GP helps young people to reflect on their own behaviour and makes them more ready for treatment or to change their behaviour. Engagement in health care has been conceptualised by Hibbard and colleagues through a model of activation that involves four levels: believing the patient role is important; having the necessary knowledge and confidence to act; acting to maintain/improve health; and 'staying the course even under stress' (Hibbard, Stockard, Mahoney, & Tusler, 2004). Activation has been linked to better health outcomes, self-efficacy, and preventive actions (Greene & Hibbard, 2012; Hibbard et al., 2004). In addition, young people's activation has been shown to improve through technology-based interventions for Coeliac Disease (Haas, Martin, & Park, 2017) and for young people with a chronic disease transitioning to adult care (Huang et al., 2014).

Another area of future research should be the involvement of parents. Parents of adolescents are unique in the health care experience, transitioning from being their child's advocate and voice to stepping back and allowing the adolescent to have private and confidential care. As I found in my co-design workshop with parents, even when the parent is not physically going into the consultation they may still continue to influence and take a strong interest in their child's health. A particularly interesting reflection by parents in my co-design workshop was how a screening tool might be "something to bring them together" with their child. Indeed, parents already recognise the potential of technology for health support

and information, with a majority (70%) of parents of adolescents reporting they would be likely to look for help on the Internet if their child was going through a tough time (Clarke, Kuosmanen, Chambers, & Barry, 2013). In the United States, even though the Bright Futures guidelines recommend routine health promotion to parents about their child, and provides paper-based screening questions for parents of young people, research suggests these guidelines aren't being followed as part of young people's routine care (Kogan et al., 2004). Future research could develop Check Up GP further and investigate how technology might facilitate the communication between a young person and their parent about health and wellbeing issues on the young person's terms. This use of Check Up GP by parents may be particularly appropriate in conjunction with the use of the app by young adolescents. As described above, young people aged 10 to 14 have their own distinct developmental characteristics and health issues. Targeting young adolescents has the potential to establish positive life-long help-seeking, health-literacy and health behaviours.

Future research could also investigate using a screening app such as Check Up GP in different settings. In particular, using a screening app as part of the health care delivered within the secondary school setting holds potential. In Australia, the Victorian State Government has funded an initiative to have GPs and nurses attend 100 secondary schools for up to one day a week in schools most in need. There is limited research for using screening technology in this setting, however there is evidence from the United States that using a screening tool in a school clinic assists the identification of issues and tailoring of intervention and preventive information to young people (Yi, Salerno, & Darling-Fisher, 2009), as well as leading to decreased rates of absences (Gall, Pagano, Desmond, Perrin, & Murphy, 2009). More research is needed to understand whether using a screening app such as Check Up GP in the school setting facilitates and enriches young people's experience of care and their health and academic outcomes in the Australian context.

8.6 Conclusion

This thesis with publication provides new knowledge about the co-design and implementation of a health and lifestyle screening app for young people attending general practice as part of their routine care. My findings highlight the importance of incorporating the requirements of all users and stakeholders, including practice support staff, in the design of a technology in general practice to ensure it meets every group's needs. Given the increasing use of health technology, this thesis also provides timely and important new knowledge of how the introduction of a screening app can improve clinical practice in general practice. In particular, this research shows how integrating screening technology into the routine care of young people improved GPs' youth-friendly and patient-centred care, which has been shown to improve satisfaction and outcomes. My findings also provide an important youth perspective on how using the screening app enriched young people's experience of seeing their GP, increased their disclosure of sensitive issues, and created scope to address unmet health needs.

My research highlights the significant value of improving the design of health technology and its administration throughout the implementation phase to respond to individual and contextual barriers and needs that emerge only when the technology is used in the complex real-world general practice setting. This work provides evidence that to drive and support sustainable technology innovation and implementation in general practice settings more resources, external to existing practice staff, are needed. Successful implementation is possible but requires adequate time, intensive facilitation, organizational leadership, and cycles of iteration.

As outlined in this thesis, a range of health compromising behaviours and mental health issues emerge during adolescence, most of which go unrecognised and untreated, and have a major impact across the life course. With general practice the most widespread health service available to young people, there are likely to be significant rewards from young people being more engaged with their health care. As shown in this thesis, one effective way to engage young people in their

health and wellbeing may be to resource preventive screening implementation into routine primary care.

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10. Appendices

Appendix A: Terms used in the systematic review literature search

Search 1 & 2: Medline and the Cochrane Review (conducted 18/11/15)

MeSH terms and Topic Field were searched as indicated by ^M or ^T respectively. No limits were set in this search.

1. Primary Health Care^M OR General Practice^M OR Family Practice^M OR "primary care"^T OR "primary practice"^T OR "family medicine"^T
- AND
2. Mass Screening^M OR Self-Assessment^M OR Risk Assessment^M OR Needs Assessment^M OR screen*^T OR assess*^T
- AND
3. Adolescent^M OR Young Adult^M OR teen*^T OR "young person"^T OR youth^T
- AND
4. Mental Disorders^M OR Mental Health^M OR Risk Factors^M OR Risk-Taking^M OR "protective factors"^T OR wellbeing^T OR psychosocial*^T OR multidimensional^T

Search 3: PsycINFO (conducted 18/11/15)

Thesaurus terms and Subject terms were searched as indicated by ^{DE} and ^{SU} respectively. No limits were set in this search.

1. "Primary Health Care"^{DE} OR "Family Medicine"^{DE} OR "general practice"^{SU} OR "family practice"^{SU} OR "primary care"^{SU} OR "primary practice"^{SU}
- AND
2. "Adolescent Development"^{DE} OR teen*^{SU} OR "young person"^{SU} OR youth^{SU} OR "young adult"^{SU} OR adolescent^{SU}
- AND
3. "Health Screening"^{DE} OR (DE "Risk Assessment"^{DE} OR "Needs Assessment"^{DE} OR "self assessment"^{SU} OR screen*^{SU} OR assess*^{SU})
- AND

4. "Mental Disorders"^{DE} OR "Mental Health"^{DE} OR "Risk Factors"^{DE} OR "Risk Taking"^{DE} OR "Protective Factors"^{DE} OR "Psychosocial Factors"^{DE} OR wellbeing^{SU} OR multidimensional^{SU}

Search 4: Scopus (conducted 18/11/15)

Keyword search used for all terms. No limits were set in this search.

1. "Primary Health Care" OR "Family Medicine" OR "general practice" OR "family practice" OR "primary care" OR "primary practice"
- AND
2. "Health Screening" OR "Risk Assessment" OR "Needs Assessment" OR screen* OR assess*
- AND
3. "Young Adult" OR adolescent OR teen* OR "young person" OR youth
- AND
- "Mental Disorders" OR "Mental Health" OR "Risk Factors" OR "Risk-taking*" OR "protective factors" OR wellbeing OR psychosocial OR multidimensional

Appendix B: Ethics approval for Study 2



07 January 2015

Associate Professor L.A. Sancí
General Practice
The University of Melbourne

Dear Associate Professor L.A. Sancí

I am pleased to advise that the Health Sciences Human Ethics Sub-Committee approved the following Project:

Project title: **Development of a technology-based psychosocial screening tool for young people in general practice**
Researchers: **Dr S D Kauer, A/Prof L A Sancí, Dr G R Wadley, M Webb**
Ethics ID: **1443228**

The Project has been approved for the period: **07-Jan-2015 to 31-Dec-2015**

It is your responsibility to ensure that all people associated with the Project are made aware of what has actually been approved.

Research projects are normally approved to 31 December of the year of approval. Projects may be renewed yearly for up to a total of five years upon receipt of a satisfactory annual report. If a project is to continue beyond five years a new application will normally need to be submitted.

Please note that the following conditions apply to your approval. Failure to abide by these conditions may result in suspension or discontinuation of approval and/or disciplinary action.

- (a) **Limit of Approval:** Approval is limited strictly to the research as submitted in your Project application.
- (b) **Variation to Project:** Any subsequent variations or modifications you might wish to make to the Project must be notified formally to the Human Ethics Sub-Committee for further consideration and approval. If the Sub-Committee considers that the proposed changes are significant, you may be required to submit a new application for approval of the revised Project.
- (c) **Incidents or adverse effects:** Researchers must report immediately to the Sub-Committee anything which might affect the ethical acceptance of the protocol including adverse effects on participants or unforeseen events that might affect continued ethical acceptability of the Project. Failure to do so may result in suspension or cancellation of approval.
- (d) **Monitoring:** All projects are subject to monitoring at any time by the Human Research Ethics Committee.
- (e) **Annual Report:** Please be aware that the Human Research Ethics Committee requires that researchers submit an annual report on each of their projects at the end of the year, or at the conclusion of a project if it continues for less than this time. Failure to submit an annual report will mean that ethics approval will lapse.
- (f) **Auditing:** All projects may be subject to audit by members of the Sub-Committee.

If you have any queries on these matters, or require additional information, please contact me using the details below.

Please quote the ethics registration number and the title of the Project in any future correspondence.

On behalf of the Sub-Committee I wish you well in your research.

Yours sincerely

A handwritten signature in blue ink, appearing to read 'J Hassell'.

Ms Jennifer Hassell - Secretary
Health Sciences HESC
Phone: 90353341, Email: hassell@unimelb.edu.au
cc: HEAG Chair - General Practice

Office for Research Ethics and Integrity
The University of Melbourne, Level 1, 780 Elizabeth St Melbourne Victoria 3010 Australia
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Appendix C: Participant recruitment ads for Study 3

2.2.1 University of Melbourne staff newsletter ad for parents

Parents of young people wanted for feedback on psychosocial screening app

Parents of young people aged 14-25 are invited to participate in a study to design a psychosocial health screening smartphone app for young people to use in general practice settings. This aim of the app is to assist in the identification of potential health concerns and to improve young people's experience of going to the doctor. Participation will be a 2-hour focus group at 5pm on Thursday 11th June at Parkville campus. Participants will be reimbursed for their time.

HREC: 1443228.1 More information: Marianne Webb, webbm@unimelb.edu.au

2.2.2 VicReN email for GPs and practice support staff

Development of a psychosocial screening app for young people: GPs needs

The University of Melbourne, together with the Young and Well Cooperative Research Centre, is undertaking research to develop a psychosocial screening app for young people to use when they see their GP. The study also aims to better understand the barriers and facilitators for how this app can be successfully adopted within current work practices and systems.

The researchers are inviting GPs to participate in an interactive workshop at 5.30pm-8.30pm on Wednesday 4th March. Food will be provided.

We can offer a \$250 payment to offset GP costs associated with participating in this study.

If you would like to register your interest in participating, please contact Marianne Webb at webbm@unimelb.edu.au or on 0407 368 721.

2.2.3 Facebook ad for young people

Participants needed to design an app that helps young people to identify issues they'd like to talk about with their GP.

Website content for young people (linked from Facebook ad)

Design an app to improve the experience of going to your GP

We are looking for young people aged 14 to 25 to help us design an app that enables young people to identify issues they'd like to talk about with their GP. The research is funded by the Young and Well Cooperative Research Centre.

For more information or to indicate your interest please contact Marianne Webb on 0407 368 721 or webbm@unimelb.edu.au.

What will I be asked to do?

You will be asked to attend one workshop at or near the University of Melbourne campus in Parkville in January 2015. You'll participate in a number of (fun!) hands-on activities with other young people to explore and identify what content and functionality the app needs to have. The workshop will last 3 to 4 hours. You will be paid a \$60 gift voucher and we'll even give you food!

Why should I participate?

Your suggestions and insights will inform the design of the app that will then be piloted with young people in general practice settings. The ultimate aim of the app is to be a tool that will improve young people's experience of going to see their GP.

How can I sign up to be involved?

To indicate your interest, contact Marianne Webb (ph: 0407 368 721) providing your phone number or email address. We will contact you to check you are eligible to take part and, if you are, give you details about the workshop)

Where can I get further information?

Further information about this study is included in the plain language statement and consent form (attached).

This research project has been approved by the University of Melbourne's Human Research Ethics Committee (HREC Reference #1443228). Should you have any concerns about the conduct of the project, you are welcome to contact the Executive Officer, Human Research Ethics, The University of Melbourne, on phone: 8344 2073, or fax: 9347 6739.

Appendix D: Ethics approval for Study 3



25 September 2015

A/Prof Lena Sanci
General Practice
The University of Melbourne

Dear A/Prof Sanci

I am pleased to advise that the Health Sciences Human Ethics Sub-Committee approved the following Project:

Project title: **Investigating the implementation of a technology-based psychosocial screening tool for young people in general practice: an action research study**
Researchers: **Dr S D Kauer, A/Prof L A Sanci, Dr G R Wadley, M Webb**
Ethics ID: **1544281**

The Project has been approved for the period: **25-Sep-2015 to 31-Dec-2015**

It is your responsibility to ensure that all people associated with the Project are made aware of what has actually been approved.

Research projects are normally approved to 31 December of the year of approval. Projects may be renewed yearly for up to a total of five years upon receipt of a satisfactory annual report. If a project is to continue beyond five years a new application will normally need to be submitted.

Please note that the following conditions apply to your approval. Failure to abide by these conditions may result in suspension or discontinuation of approval and/or disciplinary action.

(a) **Limit of Approval:** Approval is limited strictly to the research as submitted in your Project application.

(b) **Variation to Project:** Any subsequent variations or modifications you might wish to make to the Project must be notified formally to the Human Ethics Sub-Committee for further consideration and approval. If the Sub-Committee considers that the proposed changes are significant, you may be required to submit a new application for approval of the revised Project.

(c) **Incidents or adverse effects:** Researchers must report immediately to the Sub-Committee anything which might affect the ethical acceptance of the protocol including adverse effects on participants or unforeseen events that might affect continued ethical acceptability of the Project. Failure to do so may result in suspension or cancellation of approval.

(d) **Monitoring:** All projects are subject to monitoring at any time by the Human Research Ethics Committee.

(e) **Annual Report:** Please be aware that the Human Research Ethics Committee requires that researchers submit an annual report on each of their projects at the end of the year, or at the conclusion of a project if it continues for less than this time. Failure to submit an annual report will mean that ethics approval will lapse.

(f) **Auditing:** All projects may be subject to audit by members of the Sub-Committee.

If you have any queries on these matters, or require additional information, please contact me using the details below.

Please quote the ethics registration number and the title of the Project in any future correspondence.

On behalf of the Sub-Committee I wish you well in your research.

Yours sincerely

Ms Hilary Young - Secretary
Health Sciences HESC
Phone: 03 8344 8595, Email: hilary.young@unimelb.edu.au

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Appendix E: VicReN recruitment ad for practice for Study 3

The University of Melbourne, together with the Young and Well Cooperative Research Centre, is undertaking research to implementation of a psychosocial screening app for young people to use when they see their GP.

The study also aims to better understand the barriers and facilitators for how this app can be successfully adopted successfully within current work practices and systems.

This is an action research study, meaning that researchers will work closely with the whole practice through a cyclical process of collecting, feeding back and reflecting on the use and administration of the tool.

Overall we expect the involvement of the practice will be approximately three months, with the first month being baseline data collection and training, and the remaining two months being weekly or fortnightly review meetings.

To be eligible, this general practice will need to be:

- located in Victoria;
- already use the SMS feature of their clinical software to communicate with their patients (in order to send a link to the screening tool),
- see a minimum of at least 40 young people aged 14 to 25 per week, and
- be able to demonstrate a willingness of the majority of GPs and all practice staff to participate.

We can offer a \$2000 payment to offset GP costs associated with participating in this study; with \$1000 paid upon agreement to participate and \$1000 at the end of data collection.

If you would like to register your interest in participating or for more information, please contact Marianne Webb at webbm@unimelb.edu.au or on 0407 368 721.

Appendix F: Young person eligibility form for Study 3



Check Up GP Eligibility Assessment Form

Please assess the eligibility of each young patient aged 14-25 to participate in the Check Up GP research study, and ask the young person to return it to reception or the researcher

Dr Name _____

Patient Date of Birth (dd/mm/yyyy): __ / __ / ____

Patient Gender (please circle): Male/ Female

/Other

Is the young person eligible to be involved in the study? (please tick yes/no. If no provide reason)

☐ Yes ☐ No (please tick reason):

☐ Very unwell (e.g. vomiting, febrile, weak, psychotic) ☐ Unable to read/speak English ☐ Under 18 and NOT a mature minor

☐ Other (please specify): _____

Appendix G: Check Up GP screening questions and suggested actions

Key Themes	Question	Scoring and Risk indicator R=high risk O=medium risk G=good	GP Suggested actions (and referrals)
Home (life)	1. What is your date of birth?		
	2. Which gender(s) do you identify as? 2.1 Female 2.2 male 2.3 trans* 2.4 Intersex 2.5 Other (please describe)	R= 2.3, 2.4, 2.5 (and show text for 2.5 Other)	- Check young person wants to discuss - Normalise and empathise any difficulties - Assess associated health risks e.g. mental illness, substance use - Identify sources of support Referrals - Support, information for gender diverse young people: Minus 18 [www.minus18.org.au] - Counselling, referral and information service LGBTIQ: Switchboard [http://www.switchboard.org.au] 1800 184 52
	3. How would you describe your current living situation? 3.1 I have somewhere to live and accommodation isn't an issue for me 3.2. I have somewhere to live but accommodation is an issue for me (eg, not sure how long you will be able to stay there, struggle to pay rent, major conflicts with other people in the house, etc) 3.3. I'm at risk of being homeless soon (eg, currently couch surfing, in emergency accommodation, etc) 3.4 I'm homeless / sleeping rough	3.1 G 3.2 O 3.3 R 3.4 R Star for want to talk about it	- Check immediate safety - Assess associated health risks, e.g. substance use, mental illness, violence - Identify sources of support Referrals - Support, accommodation: Melbourne Youth Support Service [https://www.melbournecitymission.org.au/services/program-detail/melbourne-youth-support-service-(myss)] (state-wide) 9614 3688 - Lifeline 131 114, Kids Helpline 1800 55 1800, eheadspace.org.au 1800 650 890 - Counselling: headspace Camberwell 9006 6500 - Information and counselling: National Sexual Assault, Domestic and Family Violence Counselling Line [www.1800respect.org.au] 1800 737 732

	4. To what extent do you get along with the people you live with? 4.1 none of the time 4.2 a little of the time 4.3 some of the time 4.4 most of the time 4.5 all of the time 4.6 not applicable	4.1 R 4.2 R 4.3 O 4.4 G 4.5 G 4.6 G Star for want to talk about it	• Empathise and normalize • Assess safety, explore coping strategies, sources of support • Identify and reinforce strengths and protective factors (e.g. school connection, peer relations) Referrals • Info, tools to promote wellbeing and resilience: Biteback [http://www.biteback.org.au] • Lifeline 131 114, Kids Helpline 1800 55 1800, eheadspace.org.au 1800 650 890 • Counselling: headspace Camberwell 9006 6500 • Information and counselling: National Sexual Assault, Domestic and Family Violence Counselling Line [www.1800respect.org.au] 1800 737 732, • Guided meditation app: Smiling mind [smilingmind.com.au]
	5. Do you think that the people you live with usually listen to you and take your feelings seriously? 5.1 none of the time 5.2 a little of the time 5.3 some of the time 5.4 most of the time 5.5 all of the time	5.1 R 5.2 R 5.3 O 5.4 G 5.5 G Star for want to talk about it	As above
	6. Have you experienced any of the following over the past 12 months (choose as many as applies to you): 6.1 You finished high school or secondary school 6.2 You started/finished uni or college 6.3 You fought or didn't get along with a family member or friend 6.4 Your parents separated, divorced or remarried 6.5 A family member or close friend had (or has) a serious illness or injury	6.1 G 6.2 O 6.3 O 6.4 R 6.5 R 6.6 O 6.7R 6.8 R 6.9 O 6.10 O 6.11 R 6.12 R 6.13 R 6.14 O 6.15 G 6.16 R 6.17 R 6.18 R 6.19 O 6.20 O [include text] 6.21 G	As above

	6.6 Family members or step-parents moved in or out of the house 6.7 A family member or close friend died 6.8 Your parent lost their job 6.9 You moved (to a new home) 6.10 You had problems or arguments with parents, siblings or family members 6.11 A family member or relative had or has emotional problems (being really sad, worried etc) 6.12 You or a parent suddenly or unexpectedly became unemployed or experienced financial hardship 6.13 You experienced a relationship breakdown with someone important to you 6.14 A family member became pregnant or is having a baby 6.15 You fell in love or began a relationship with a boyfriend/girlfriend 6.16 You broke up with or were rejected by your boyfriend/girlfriend 6.17 A family member was arrested 6.18 You got in trouble or suspended at school 6.19 You had hassles, arguments or fights with other students at school 6.20 You experienced any other significant life event (please describe) 6.21 None applicable	Star for want to talk about it	
Education / Employment	1. Which of these best describes your main activities? 1.1 Full-time work greater than or equal to 30 hours paid employment per week	1.1 G 1.2 G 1.3 R 1.4 G 1.5 O 1.6 R 1.7 G	• Empathise and normalize • Explore coping strategies • Identify sources of support Referrals for young people

	1.2 Part-time work less than 30 hours paid employment per week 1.3 Unemployed/looking for work 1.4 Home duties 1.5 Have a job but not at work due to illness, vacation etc 1.6 Not working and currently receiving sickness allowance/disability support pension 1.7 Volunteer work 1.8 Student attending school 1.9 Student attending university	1.8 G 1.9 G	- Financial support: Centrelink [www.humanservices.gov.au] 132 717 - Job seeking help: WISE Employment [www.wiseemployment.com.au] 1800 685 105 - Lifeline 131 114, Kids Helpline 1800 55 1800, eheadspace.org.au 1800 650 890 - Education and Training support: headspace Camberwell 9006 6500
	2. How do you get along with teachers/other students/workmates? (0 Not at all -10 extremely well) 3. How well are you coping with your studies/work? 0-10 scale (0 Not at all coping -10 Coping well)	2. and 3. 0-4 R 5-7 O 8-10 G Star for want to talk about it	- Empathise and normalize - Explore coping strategies and identify sources of support - Identify and reinforce strengths and protective factors (e.g. family support, peer relations) - Information, support, study tips: Reachout.com [www.reachout.com] - Lifeline 131 114, Kids Helpline 1800 55 1800, eheadspace.org.au 1800 650 890 - Counselling: headspace Camberwell 9006 6500 - Guided meditation app: Smiling mind [smilingmind.com.au]
	4. Are your grades/performance this year worse than last year? 4.1 worse 4.2 same 4.3 better 4.4 not applicable	4.1 R 4.2 G 4.3 G 4.4 G	As above
	5. Are you thinking of dropping out/leaving work or studies this year? 5.1 Yes 5.2 No 5.3 not applicable	5.1 R 5.2 G 5.3 G Star for want to talk about it	As above
	6. Do you find it hard to concentrate on study or work 6.1 Yes 6.2 No 6.3 Not applicable	6.1 R 6.2 G 6.3 G	- Empathise and normalize - Explore possible causes e.g. bullying - Identify and reinforce strengths and protective factors (e.g. family support, peer relations)

			Referrals - Information, tips: Reachout.com [www.reachout.com] - Lifeline 131 114, Kids Helpline 1800 55 1800, eheadspace.org.au 1800 650 890 - Counselling: headspace Camberwell 9006 6500 - Time management: Pomodoro timer http://tomato-timer.com - Software blocking distracting websites: Rescue time [www.rescuetime.com]
Eating , sleeping and exercise	1. How many servings per day do you usually have: 1.1 of fruit 1.2 of vegetables	1.1 and 1.2: 1-2=red; 3-4=orange 5 or more=Green	- Provide information about short-term benefits of healthy eating - Discuss realistic strategies and goals for adopting more healthy eating behaviours Referrals - Information and tips: Reachout.com [www.reachout.com] - Coach.me app: goal setting app [www.coach.me]
	2 On a normal week night, what time would you usually go to sleep? 3 On a normal weekday, what time would you usually get up in the morning?	Calculate number of hours asleep For under 18: 8-10 hours G 7 hours O 11 hours O 6 or less R 12 or more R For 18 and over 7-9 G 6 hours O 10 or 11 O 5 or less R 12 or more R	- Provide information about short-term benefits of adequate sleep - Discuss realistic strategies and goals for adopting healthy sleep patterns Referrals - Information and tips: Reachout.com [www.reachout.com] - Recharge app (Apple only): program to improve sleep and wellbeing [http://au.reachout.com/recharge-sleep-app]
	4 Do worries or problems ever stop or delay you getting to sleep or wake you up? 4.1 Yes 4.2 No	4.1 G 4.2 R Star for want to talk about it	- Empathise and normalize, explore underlying cause - Identify strategies for managing situation - Identify sources of support Referrals - Information and tips: Reachout.com [www.reachout.com] - Lifeline 131 114, Kids Helpline 1800 55 1800, eheadspace.org.au 1800 650 890 - Guided meditation app for getting to sleep: Deep Sleep on Apple [https://itunes.apple.com/au/app/deep-sleep-andrew-johnson/id337349999?mt=8] and Adroid

			[https://play.google.com/store/apps/details?id=com.hivebrain.andrewjohnson.deepsleep&hl=en] Guided meditation app: Smiling mind [smilingmind.com.au]
5	Does using the internet (and/or mobile phone, video games etc) stop or delay you from getting to sleep or wake you up? 5.1 yes 5.2 No	5.1 R 5.2 G Star for want to talk about it	- Provide information about short-term harms screen use close to bed time - Discuss realistic strategies and goals for screen use Referrals - Guided meditation app for getting to sleep: Deep Sleep Sleep on Apple [https://itunes.apple.com/au/app/deep-sleep-andrew-johnson/id337349999?mt=8] and Android [https://play.google.com/store/apps/details?id=com
	6.1 [IF <18,] In a normal week, how many times would you get at LEAST 1 hour of physical exercise a day? 6.1.1. Every day 6.1.2. Nearly every day 6.1.3. Three times a week 6.1.4 Once or twice a week 6.1.5. Hardly ever	6.1.1 G 6.1.2 G 6.1.3 O 6.1.4 R 6.1.5 R Star for want to talk about it	- Provide information about short-term benefits of adequate exercise - Discuss realistic strategies and goals for exercising more Referrals - Tips and information: Reachout.com [www.reachout.com] - Training program app to get running: Couch to 5K [http://www.active.com/mobile/couch-to-5k-app] Goal setting app: Coach.me [https://www.coach.me]
	6.1 [IF 18 or Older,] In a normal week, how much time would you spend doing moderate to vigorous exercise? 6.2.1. Less than 30mins 6.2.2. 1 hour 6.2.3. 1.5 hours 6.2.4. 2 hours 6.2.5 2.5 hours 6.2.6. 3 hours 6.2.7. more than 3 hours	6.2.1 R 6.1.2 R 6.1.3 O 6.1.4 O 6.1.5 G 6.1.6 G 6.2.7 G Star for want to talk about it	As above
7	Do you have any concerns, or questions, about the size or shape of your body, or your physical appearance? 7.1 Yes (if yes, please describe) 7.2 No.	7.1 R [include text] 7.2 G Star for want to talk about it	- Empathise and normalize concerns - Assess if underlying physical problem Referrals - Body image factsheet National Eating Disorders Collaboration [

			http://www.nedc.com.au/files/lo gos/0638_NEDC_FS_BI_v4.pdf - Information and support: Reachout.com [www.reachout.com] - App promoting positive body image: Body Beautiful [https://itunes.apple.com/gm/app/body-beautiful/id458240693?mt=8] (Apple only)
	8 Do you make yourself sick because you feel uncomfortably full? 8.1 Yes 8.2 No 9 Do you worry you have lost control over how much you eat? 9.1 Yes 9.2 No 10 Have you recently lost more than 5kg in a 3 month period? 10.1 Yes 10.2 No 11 Do you believe yourself to be fat when others say you are too thin? 11.1 Yes 11.2 No 12 Would you say that food dominates your life? 12.1 Yes 12.2 No	SCOFF Scoring: Add points Q8-12 , Yes=1 point, No=0 points Score greater or equal to 2 indicates possible anorexia nervosa or bulimia nervosa 2=R; 1=O 0=G	- Empathise and acknowledge difficulty and positivity of disclosure - Assess physical symptoms and behaviours, and need for intervention - Discuss benefits and options for treatment - Coordinate a collaborative multidisciplinary treatment plan (dietitian, psychologist/psychiatrist etc) Referrals - Information and support: National Eating Disorders Collaboration [www.nedc.com.au] - Phone and web counselling: Butterfly National Support [www.thebutterflyfoundation.org.au] 1800 33 4673 - Eating disorder management app: Rise Up + Recover [https://www.recoverywarriors.com/app/]
Activities and peer relationships	1 What activities do you like doing (with friends or alone)? Playing sport, listening to music, playing computer/console games, reading, going out with friends, photography, eating, writing, talking or texting with friends, smoking, playing with my pets, travelling, shopping, talking with others, art and craft, watching tv, other, none	>1 =G None=R	- Determine if situation is problematic - Explore benefits and strategies to finding activities they like - Identify and reinforce strengths and protective factors Referrals - Information and support: reachout.com - Lifeline 131 114, Kids Helpline 1800 55 1800, eheadspace.org.au 1800 650 890
	2 Do you have friends that you enjoy spending time with? 2.1 Yes 2.2 No.	Yes=G N=R	- Determine if situation is problematic - Explore benefits and strategies to expanding social networks

			- Identify and reinforce strengths and protective factors (e.g. family support, school connection) Referrals - Information and support: reachout.com [www.reachout.com] - Lifeline 131 114, Kids Helpline 1800 55 1800, eheadspace.org.au 1800 650 890
	3 Do you ever feel lonely or left out of activities? 3.1 Yes 3.2 No	Yes=G N=R	As above
	4 Have you experienced bullying or harassment in the last 12 months? 5.1 Yes 5.2 No	Yes=R N=G	- Emphasise bullying is not patient's fault - Encourage patient not to tackle bullying alone, explore support network - Assess safety and co-morbidity - Discuss enlisting other adults, person in authority Referrals - Information, tips and support: Take a stand together [www.takeastandtogether.gov.au] - Information and support: reachout.com [www.reachout.com] - Lifeline 131 114, Kids Helpline 1800 55 1800, eheadspace.org.au 1800 650 890 - Counselling: headspace Camberwell 9006 6500
	5 Are you worried that you are addicted to something or that you're spending too much time doing it? 5.1 Yes (if yes, please describe) 5.2 No	Yes=Red [show text] No=Green	- Discuss underlying reasons for use - Discuss potential short-term benefits and harms to behavior - Discuss strategies and goals to minimize harm and reduce use Referrals - Lifeline 131 114, Kids Helpline 1800 55 1800, eheadspace.org.au 1800 650 890 - Counselling: headspace Camberwell 9006 6500
		Yes=Red No=Green	- Discuss underlying reasons for use, - Discuss potential short-term benefits and harms to behavior - Discuss strategies and goals to minimize harm and reduce use Referrals

			- Lifeline 131 114, Kids Helpline 1800 55 1800, eheadspace.org.au 1800 650 890 - Counselling: headspace Camberwell 9006 6500
		Yes=Red No=Green	- Discuss underlying reasons for use and scope of problem - Discuss potential short-term benefits and harms to behavior - Discuss strategies and goals to minimize harm and reduce use - Lifeline 131 114, Kids Helpline 1800 55 1800, eheadspace.org.au 1800 650 890 - Counselling: headspace Camberwell 9006 6500
		Yes=Red No=Green	- Discuss underlying reasons for use and scope of problem - Discuss potential short-term benefits and harms to behavior - Discuss strategies and goals to minimize harm and reduce use Referrals - Counselling, information, support: Gambling Help Online [http://www.gamblinghelponline.org.au] 1800 858 858 - Counselling: headspace Camberwell 9006 6500
Drugs	1. Are you currently taking any prescribed medication? 1.1 Yes (if yes, please name medication and what you're taking it for) 1.2 no	Yes= R [display text] No=G	
	2. During the past 12 months have you: 1.1 Drunk any alcohol (more than a few sips)? 1.1.1 Yes 1.1.2 no 1.2 Smoked any marijuana or hashish? 1.2.1 Yes 1.2.2 No	CRAFT Scoring Each yes for questions 2-7 is 1 point Score of 2 or greater indicates potential significant problem 2pts or more =R 1 pt =O 0 pt=G Star for want to talk about it	- Discuss underlying reasons for use - Discuss potential short-term benefits and harms to behavior (e.g. unsafe sex) - Discuss strategies and goals to minimize harm and reduce use - Identify and reinforce strengths and protective factors (e.g. family support, school connection) Referrals - Online, phone counselling: Counselling Online

	1.3 Used anything else to get high (includes illegal drugs, over the counter and prescription drugs, and things that you sniff)? 1.3.1 Yes 1.3.2 No [if no to all in 1, see only question 2] [If yes to any in question 1, see 2-7]: 2 Have you ever ridden in a car driven by someone (including yourself) who was high or had been using alcohol or drugs 2.1 Yes 2.2 No 3 Do you ever use alcohol or drugs to relax, feel better about yourself or fit in? 3.1 yes 3.2 no 4 Do you ever use alcohol or drugs while you are by yourself, alone? 4.1 Yes 4.2 no 5 Do you ever forget things you did while using alcohol or drugs? 5.1 yes 5.2no 6 Do your family or friends ever tell you that you should cut down on your drinking or drug use? 6.1 Yes 6.2 No 7 Have you ever gotten into trouble while you were using alcohol or drugs? 7.1 yes 7.2 no		[http://www.counselingonline.org.au] 1800 888 236 • Information and support: Reachout.com • Counselling: headspace Camberwell 9006 6500 • Alcohol app: Ray's Night Out [https://itunes.apple.com/au/app/rays-night-out/id978589497?mt=8] (Apple only), Hello Sunday Morning [https://itunes.apple.com/au/app/hsm/id961582035?mt=8] (Apple only) • Tobacco app: My Quit Buddy [http://www.quitnow.gov.au/internet/quitnow/publishing.nsf/Content/quit-buddy] Resources for GPs • Advice on clinical management of drug and alcohol issues: Drug and Alcohol Clinic Advisory Service 1800 812 804 • Referral for intake and assessment services Directline [http://www.directline.org.au/service-finder] 1800 888 236
Sexuality/sexual health	1. Which of the following best describes how you think of yourself in terms of your sexual preference? 1.1 Heterosexual/straight 1.2 Lesbian, 1.3 Gay, 1.4 Bisexual,	1.6 Display text Star for want to talk about it	• Normalise and empathise any difficulties • Assess associate health risks e.g. mental illness, substance use, STI risk • Identify sources of support Referrals

	1.5 Questioning (not sure if you are straight, gay, lesbian or bisexual) 1.6 Other sexuality (please describe): 1.7 Choose not to answer		- Counselling, referral and information service for LGBTIQ: Switchboard [http://www.switchboard.org.au] 1800 184 527 - Support and information for same sex and gender diverse: Minus 18 [www.minus18.org.au]
	2. Have you had sex in the last 12 months? (This includes oral) 2.1 Yes [go to Q3] 2.2 No [go to Q7]	Yes R No G	
	[If yes to 2:] 3. Do you always use contraception? 3.1 Yes 3.2 No [If yes to 2] 4. Do you always use protection against STIs with condoms or dental dams? 4.1 Yes 4.2 No	[for both] Yes = G No = R	- Check patient's knowledge e.g. safe and unsafe sex, contraception - Discuss potential harms of unsafe sex - Explore ways to reduce risk taking and to negotiate safe sex Referrals - Sexual health care, counselling, information referral: Action Centre (Family Planning Victoria) [http://www.fpv.org.au/health-care/action-centre/health-care-for-young-people] 03 9660 4700 - Information on STIs and contraception: Marie Stopes International) [www.drmarie.org.au] - Sexual health and STI info app: My Sex Doctor [http://mysexdoctor.org/]
	Are you worried you might be pregnant? Yes No	Y=R N=G	- Take a sexual history, assessing for STI risk - Organise a pregnancy test as needed - Refer to specialist service where necessary Referral - Pregnancy and termination counselling: Action Centre (Family Planning Victoria) [http://www.fpv.org.au/health-care/action-centre/health-care-for-young-people], 03 9660 4700; Marie Stopes International 1300 003 707, - Pregnancy and termination information, counselling: Royal Women's Hospital [https://www.thewomens.org.au/health-information]
	[If yes to 2] 5. Are you worried you might have an STI?	Y=R N=G	- Take a sexual history if time, assessing for STI risk - Organise STI screening/testing as

	5.1 Yes 5.2 No		appropriate. Melbourne Sexual Health Centre Treatment Guidelines [http://www.mshc.org.au/HealthProfessional/MSHCTreatmentGuidelines/tabid/116/Default.aspx#.Vl5bV3YrJD8] Referral - Sexual health care, counselling , information referral: Action Centre (Family Planning Victoria): [http://www.fpv.org.au/health-care/action-centre/health-care-for-young-people] 03 9660 4700 - Information on STIs and contraception: Marie Stopes International [www.drmarie.org.au] - Informing sexual partners of STI status: Let them know [www.letthemknow.org.au] - Sexual health and STI info app: My Sex Doctor [http://mysexdoctor.org/]
	[If yes to 2:] 6. Have you ever felt pressured or uncomfortable about having sex 6.1 yes 6.2 no	Yes R No G	- Empathise and acknowledge experience - Discuss how to negotiate safe sex or condom use - Assess immediate safety and risk (If under 18, assess need for mandatory reporting) - Provide information about possible referral, support service Referral - Information and counselling: 1800RESPECT [www.1800respect.org.au] 1800 737 732, - Mandatory reporting for under 18: Eastern suburbs 1300 360 391 - Lifeline 131 114, Kids Helpline 1800 55 1800, eheadspace.org.au 1800 650 890
	7. Have you ever sent or received naked pictures of yourself to another through text or email? 7.1 Yes 7.2 No	Yes=orange N=G	- Discuss potential short-term benefits and harms to behaviour - Discuss importance of consent Referrals - Information and tips on technology and relationships: Think you know (UK) [www.thinkuknow.co.uk/14_plus]

			Information and tips: esaftey.gov.au [esaftey.gov.au]
	8. Do you have any concerns or questions about your sexual identity? 8.1 Yes (if yes, please tell us) 8.2 no	Yes=red [display text] Star for want to talk about it	- Acknowledge and normalize - Assess associated health risks, e.g. substance use, mental illness - Identify sources of support Referrals - Counselling, referral and information service for LGBTIQ: Switchboard 1800 184 527 www.switchboard.org.au - Support, information for gender diverse young people: Minus 18 [www.minus18.org.au] - Counselling: headspace Camberwell 9006 6500
Suicide/ depression	1. Is there someone you could go to if you needed help with a problem? 1.1 Yes 1.2 No	No=R Yes=G Star for want to talk about it	- Explore coping strategies - Identify sources of support - Identify and reinforce strengths and protective factors (e.g. family support, school connection) Referrals - Information and tips: Reachout.com [www.reachout.com] - Free and confidential counselling: Lifeline 131 114, Kids Helpline 1800 55 1800, eheadspace.org.au 1800 650 890
	2 Are you feeling stressed about something? 2.1 Yes [please describe] 2.2 No	No=R Yes=G	- Explore coping strategies, including exercise - Identify sources of support - Identify and reinforce strengths and protective factors (e.g. family support, school connection, peer relations) Referrals - Information and tips: Reachout.com Free and confidential counselling: Lifeline 131 114, Kids Helpline 1800 55 1800, eheadspace.org.au 1800 650 890 - Tracking things to be grateful for app: Gratitude Journal [http://getgratitude.co/] - Deep breathing app: Breathe2relax [http://t2health.dcoe.mil/apps/breathe2relax]

			Coping tools app: MindShift [http://www.anxietybc.com/resources/mindshift-app]
	3 Over the past two weeks, how often have you been bothered by any of the following problems? 2.1 Feeling nervous, anxious or on edge 2.2 Not being able to stop or control worrying 2.3 Little interest or pleasure in doing things. 2.4 Feeling down, depressed, or hopeless. Options for each Not at all Several days More than half the days Nearly every day	Scoring 0 Point= Not at all 1 pts= Several days 2pts More than half the days 3pts = Nearly every day Anxiety score (GAD-2)= Add pts for 2.1 and 2.2 3pts or greater =R 1-2pts =O 0=G Score of 3 or more is positive for anxiety Depression score (PHQ-2)= add pts for 2.3 and 2.4 3pts or greater =R 1-2pts =O 0pt=G Score of 3 or more is positive for depression Star for want to talk about it	- Explore history and current situation - Assess for co-morbid health problems (e.g. substance use) and suicide risk - Develop a mental health plan to coordinate collaborative treatment Referrals - Counselling and information: Youth beyondblue [www.youthbeyondblue.com] - Lifeline 131 114, Kids Helpline 1800 55 1800, eheadspace.org.au 1800 650 890 - Counselling: headspace Camberwell 9006 6500 - Online self-help program: ecouch [https://ecouch.anu.edu.au] - Depression/anxiety tips and tools app: WellMind on Google Play [https://play.google.com/store/apps/details?id=com.bluestepsolutions.wellmind&hl=en] and Apple [https://itunes.apple.com/us/app/wellmind/id918138339?mt=8]
	4 Sometimes people can hear or see things that others don't seem to see or hear. Has this ever happened to you? 4.1 Yes 4.2 No 5 Have you ever felt like someone was out to get you? 5.1 Yes 5.2 No. 6 Have you ever felt like someone might be controlling your thoughts, feelings, actions or urges? 6.1 Yes 6.2 No 7 Have you ever found yourself feeling really 'up' or racy? 7.1 Yes 7.2 No 8 Have you ever gone for days without sleep? 8.1 Yes 8.2 No	For each Q4-Q8 Yes – R No – G	- Explore history and current situation - Assess co-morbid health problems (e.g. substance use), suicide risk, risk to others - Use Medicare Mental Health Item Numbers to develop a care plan and specialist service referral Referrals - DHHS psychiatric triage, assessment, referral: 1300 721 927 - Information and tools: Reachout.com [www.reachout.com] - Lifeline 131 114, Kids Helpline 1800 55 1800, eheadspace.org.au 1800 650 890 - Counselling: headspace Camberwell 9006 6500 - Online treatment program: On track [https://www.ontrack.org.au/web/ontrack/programs/get-real]

	9 Have you ever deliberately harmed or injured yourself (like cutting, burning, or scratching yourself)? 9.1 Yes 9.2 No	Yes=R No=G Star for want to talk about it	- Assess physical harm (e.g. wounds) and suicide risk - Discuss underlying or precipitating problems - Explore alternative coping and harm minimization techniques Referrals - Information: Youth beyondblue [www.youthbeyondblue.com] - Lifeline 131 114, Kids Helpline 1800 55 1800, eheadspace.org.au 1800 650 890 - Counselling: headspace Camberwell 9006 6500
Safety	1. Do you ever travel more than 10km over the speed limit when you ride a motorcycle or drive a car? 1.1 Yes 1.2 No 1.3 Not applicable 2. Do you ever use a mobile phone when you are driving? 2.1 Yes 2.2 No 2.3 Not applicable 3. Do you ever drive when you are tired? 3.1 Yes 3.2 No 3.3 Not applicable	For Q1-3 Yes=R No = G Not applicable = G	- Discuss potential short-term benefits and harms to behaviour - Discuss strategies to minimize harm, eg refusal and assertive skills Referrals - Driving mode app: Road Mode [https://play.google.com/store/apps/details?id=au.gov.vic.vicroads.roadmode&hl=en] (Android only)
	4. Have you ever felt threatened or unsafe of a family member or someone you live with? 4.1 Yes 4.2 no	For Q 4-5 Yes=R No=G Star for want to talk about it	- Demonstrate you believe young person, and reinforce violence is never ok - Assess immediate safety and risk (and assess need for mandatory reporting if under 18) - Provide information about possible referral, support service Referrals - Information and counselling: National Sexual Assault, Domestic and Family Violence Counselling Line [www.1800respect.org.au] 1800 737 732 - Mandatory reporting for under 18: Eastern suburbs 1300 360 391

			- Lifeline 131 114, Kids Helpline 1800 55 1800, eheadspace.org.au 1800 650 890 - Domestic and family violence app: Aurora [https://www.women.nsw.gov.au/violence_prevention/domestic_and_family_violence_app]
	5. Have you ever felt threatened or unsafe of someone you are (or were) in a relationship with? 5.1 Yes 5.2 no		As above
	6. Have you been in a physical fight during the past 3 months? 6.1 Yes 6.2 No	6.1 R 6.2 G Star for want to talk about it	- Discuss underlying causes - Explore alternatives to violence - Identify and reinforce strengths and protective factors (e.g. family support, school connection) Referrals - Guided meditation app: Smiling mind [smilingmind.com.au] - Deep breathing app: Breathe2relax [http://t2health.dcoe.mil/apps/breathe2relax] - Counselling: headspace Camberwell 9006 6500
Other	Is there anything else you would like to tell or ask the doctor about your physical and/or mental health? Yes (please tell us) No	Yes=R [include text] No = G	- Normalise and empathise - Explore coping strategies - Refer as needed
	Please tell us in up to three words how you felt completing this tool [text box]		
	What do you think about using this tool before seeing your doctor? Good idea Bad idea Not sure		