University Library

MINERVA ACCESS

A gateway to Melbourne's research publications

Minerva Access is the Institutional Repository of The University of Melbourne

Author/s:
Loi, SM;Wanasinghage, S;Goh, A;Lautenschlager, NT;Darby, DG;Velakoulis, D

Title:
A pilot study investigating the feasibility of symptom assessment manager (SAM), a Web-based real-time tool for monitoring challenging behaviors

Date:
2018-04-01

Citation:
Loi, S. M., Wanasinghage, S., Goh, A., Lautenschlager, N. T., Darby, D. G. & Velakoulis, D. (2018). A pilot study investigating the feasibility of symptom assessment manager (SAM), a Web-based real-time tool for monitoring challenging behaviors. International Journal of Geriatric Psychiatry, 33 (4), pp.576-582. https://doi.org/10.1002/gps.4820.

Persistent Link:
https://hdl.handle.net/11343/293821

Loi Samantha (Orcid ID: 0000-0002-4953-4500)

A pilot study investigating the feasibility of Symptom Assessment Manager (SAM), a web-based real time tool for monitoring challenging behaviors.

Samantha M Loi[1,2]

Sangeeth Wanasinghage[2]

Anita Goh[1,2]

Nicola T Lautenschlager[1,3]

David G Darby[4]

Dennis Velakoulis[2]

[1]Academic Unit for Psychiatry of Old Age, Department of Psychiatry, The University of Melbourne, NorthWestern Mental Health, Melbourne Health, Parkville, Victoria, Australia 3052.

[2]Neuropsychiatry Unit, Melbourne Neuropsychiatry Centre, The University of Melbourne, NorthWestern Mental Health, Melbourne Health, Parkville, Victoria, Australia 3050.

[3]School of Psychiatry and Clinical Neurosciences and Western Australia Centre for Health and Ageing, University of Western Australia, Perth, Australia 6009.

[4] The Florey Institute of Neuroscience and Mental Health, Parkville, Victoria, Australia 3050.

Corresponding author: Dr Samantha M Loi, Academic Unit for Psychiatry of Old Age, Department of Psychiatry, The University of Melbourne, 34-54 Poplar Road, Parkville, Victoria, Australia, 3052.

Phone: +61 3 8387 2767

Email: Samantha.loi@unimelb.edu.au

Author Manuscript

This is the author manuscript accepted for publication and has undergone full peer review but has not been through the copyediting, typesetting, pagination and proofreading process, which may lead to differences between this version and the Version of Record. Please cite this article as doi: 10.1002/gps.4820

This article is protected by copyright. All rights reserved.

A pilot study investigating the feasibility of Symptom Assessment Manager (SAM), a web-based real time tool for monitoring challenging behaviors.

Abstract

Objective: Improving and minimizing challenging behaviors seen in psychiatric conditions, including behavioral and psychological symptoms of dementia (BPSD) is important in the care of people with these conditions. Yet, there is a lack of systematic evaluation of these as a part of routine clinical care. The Neuropsychiatric Inventory (NPI) is a validated and reliable tool for rating the severity and disruptiveness of challenging behaviors. We report on the evaluation of a web-based Symptom Assessment Manager (SAM), designed to address the limitation of previous tools using some of the NPI functions, to monitor behaviors by staff caring for people with dementia and other psychiatric conditions in inpatient and residential care settings.

Methods: SAM was piloted in an eight-bed inpatient neuropsychiatry unit over five months. Eleven nurses and four clinicians were trained in usage of SAM. Primary outcomes were usage of SAM, and perceived usability, utility and acceptance of SAM. Secondary outcomes were the frequencies of documented behavior. Usage data was analyzed using chi-square and logistic regression analyses.

Results: SAM was utilized for all admitted patients regardless of diagnosis, with a usage rate of 64% for nurses regularly employed in the unit. Staff provided positive feedback regarding the utility of SAM.

Author Manuscript

This article is protected by copyright. All rights reserved.

Conclusions: SAM appeared to offer individualized behavior assessment by providing a quick, structured, and standardized platform for assessing behavior in a real-world setting. Further research would involve trialing SAM with more staff in alternative settings such as in home or residential care settings.

Keywords: dementia, challenging behaviors, technology, assessment

Key points: SAM appears to be acceptable to use, is easy-to-use and provides useful clinical information in the monitoring of challenging behaviors.

Author Manuscript

This article is protected by copyright. All rights reserved.

Introduction

Dementia is a progressive neurodegenerative condition that can affect memory, visuospatial function, personality and executive function.[1] Behavioral and psychological symptoms of dementia (BPSD), also known as neuropsychiatric symptoms, are non-cognitive manifestations of dementia, and include aggression, agitation, psychosis and depression.[2] BPSD can adversely affect the quality of life [3] and morbidity of people with dementia,[4] can also contribute to carer burden[5] and be the precipitant of transition to residential care.[6] For formal carers, such as staff who work in residential care facilities, BPSD may be associated with burnout and job dissatisfaction.[7] These behaviors are also manifest in people who have other psychiatric conditions such as schizophrenia, depression and bipolar disorder.

There are well-described management strategies, both pharmacologically and non-pharmacologically for these challenging behaviors.[8] However, in order to appropriately manage these, detailed assessment of the timing, frequency and antecedents of specific behaviors is required. For dementia, a recent systematic review of BPSD measures[9] assessed 45 validated and reliable measures, including 29 which related to specific behaviors. However, in spite of the availability of these measures, these are not often a part of routine care.[9] This is unfortunate since they would be of significant use to visiting clinicians particularly in residential facilities[10] where there are barriers that impede accurate characterization of behaviors. These barriers include residential staff prioritizing other tasks (such as personal care) over monitoring and charting of behaviors and lack of residential staff training to use validated tools.

This article is protected by copyright. All rights reserved.

Previous studies have observed that assessments are more likely to be completed by staff if they are quick-to-use, and address clinically relevant contextual information. Instruments that utilize simple interfaces for data entry and display, and real time data validation, analysis and display would be useful.[9, 10] As far as the authors are aware, there are no previously validated instruments that have a digital web-based format. Residential care staff acceptance of such systems would facilitate their use which is important for reliable measurement. Indeed, in order to evaluate staff acceptance of new technology, the Technology Acceptance Model (TAM) has been developed to assess the acceptance of various technologies being introduced to healthcare providers, which focuses on both perceived usefulness and perceived usability.[11, 12]

The purpose of this paper is to report a study which piloted the use of a real-time, web-based assessment, called Symptom Assessment Manager (SAM), using domains of the Neuropsychiatric Inventory (NPI) as sample symptoms and which has the added flexibility to monitor behaviors in real-time. The major objective was to investigate whether SAM addressed the limitations of previous assessment methods, using the framework of the TAM. The questions to be investigated were whether SAM will be: 1. acceptable to use by nursing staff; 2. easy-to use by nursing staff; and 3. useful for the nursing staff and staff who review and recommend treatment for the behaviors (denoted specialist staff).

Methods

This study was approved by the Melbourne Health Human Research Ethics Committee and was conducted at an inpatient neuropsychiatry assessment unit (NPU) based in Melbourne, Victoria, Australia. This unit had eight beds and admitted patients with a variety of psychiatric conditions such

This article is protected by copyright. All rights reserved.

Author Manuscript

as dementia, schizophrenia and Huntington's disease. Many of these patients displayed BPSD and other challenging behaviors.

Symptom Assessment Manager (SAM)

A 2014 review [9] advocated the Neuropsychiatric Inventory (NPI) developed by Cummings et al[13] as one of the more efficient methods of assessing BPSD. It has several forms (for example, nursing home and brief versions) and measures the Severity, Duration and Frequency of 10 individual behaviors (such as agitation, anxiety and depression) and two neurovegetative changes (sleep and appetite), as well as their occupational disruptiveness. Specific definitions for each behavior are provided, which may help interpretation and reduce the subjectivity of the behavior. It is used here for research purposes as it is freely available for use in non-commercial studies (http://npitest.net/about-npi.html). For example, apathy is defined as "does he/she seem less interested in his/her usual activities or in the activities of others?". We utilized the domains of the NPI as examples of symptoms that could be evaluated using SAM but the symptoms that can be monitored are customizable. We do not intend this tool to be a substitute for the NPI but a tool for the serial mapping of individualized symptoms.

SAM was based on the NPI symptom descriptions [URL www.cerescape.com/sam/], with the exception that there was no need to adopt the NPI's Frequency measure (as it is rated retrospectively), as the behaviors are entered in real-time with SAM. Thus, staff were encouraged to enter when the behavior was occurring repeatedly, providing a more accurate measure of frequency of behavior occurrence. The Severity and Occupational Disruptiveness scales as per the NPI, were used, as well as additional features, including the date, time and duration of the behavior. It is noted

This article is protected by copyright. All rights reserved.

Author Manuscript

that real-time entry of data, compared to set times for entry may lead to the rating "zero" being ambiguous, as it could mean the behavior was absent, or the behavior was of "zero" Severity/Occupational Disruptiveness. Raters were encouraged to identify themselves using their initials and to add relevant comments (figure 1) which helped provide the possible antecedents and context of the behavior. An advantage of SAM is the real-time graphical display of these measures (figure 2). SAM also allowed non-NPI behaviors to be added as well, which also adds to its flexibility compared to other established behavior rating tools. SAM was accessible via the internet, at any time using a secure login and password on any internet-enabled device. Although any person entering data could nominate monitoring any number of behaviors, it was recommended that a maximum of three behaviors should be monitored to maximize accuracy and completeness of the entered data.[10]

Questionnaires

Two questionnaires were developed by one of the authors (SW) based on the TAM for this study. The Acceptance Questionnaire had 9-items with a 5-point Likert scale, ranging from "strongly disagree" to "strongly agree" for responses and was used to assess the initial level of acceptance of SAM. The Usability and Usefulness questionnaire comprised of 16 items with items 1 – 10 assessing *perceived ease-of-use* and items 11 – 16 *perceived usefulness*. These were also assessed on a 5-point Likert scale. Two further open-ended questions requested feedback regarding the advantages and disadvantages of SAM.

Feasibility of use

Feasibility was assessed by the usage patterns of SAM and monitoring the number of entries made in SAM for nurse shifts in the morning (7am to 3pm) and afternoon (1pm to 9pm), across 100

This article is protected by copyright. All rights reserved.

Author Manuscript

consecutive days (a total of 200 shifts). This enabled evaluation of SAM usage in relation to particular staff members, the number of patients admitted, and the nurse-to-patient ratios. It also allowed evaluation of the usage during different shifts and weekdays compared to weekend days. The nurse-to-patient ratio and number of admitted patients were used as an indirect indicator of nursing workload, with larger ratios and more inpatients representing higher levels of workload.[14] Staff were blinded to the period of observation when the usage was analyzed to minimize potential observational bias. SAM entries were counted for each shift and the number and type of nurse were identified through the shift roster.

Procedure

Any of the patients that were admitted to the unit who displayed challenging behaviors, including those who had a diagnosis of dementia of any etiology and had BPSD were eligible to have their behaviors monitored using SAM. Nursing staff who were working with the patients were identified as the key staff who identified and entered the information about the behaviors into SAM. The NPU nursing staff comprised of regular staff (those who are regularly employed at the NPU); bank staff (nursing staff who have occasional shifts and are on a list specifically to work at the NPU if there are no regular staff available); and agency staff (nursing staff from agencies who are contacted to work if there are no regular or bank staff available – and hence have less knowledge and experience working at the NPU compared to the regular and bank staff).

SAM was introduced to the NPU over a three-week period to allow for regular nursing staff variation. One of the authors (SW) was responsible for providing brief training to the staff. This consisted of SW demonstrating using SAM to individual nurses which took between 5 to 10 minutes. SW was

This article is protected by copyright. All rights reserved.

Author Manuscript

present every weekday morning for these initial three weeks for troubleshooting. A "train the trainer" approach was utilized, with these nurses then teaching other staff how to use SAM. In addition, a one-page A4 instructions leaflet was made available and two of the authors (SL and SW) were easily contactable if questions arose. Nursing staff were administered the Acceptance questionnaire one month after commencement of using SAM, and the Usability and Usefulness questionnaire at the completion of the trial. Specialist staff were administered the Usefulness section to assess perceived usefulness of SAM at the end of the trial. They were not administered the Acceptance questionnaire as they did not enter data. None of the authors were administered the questionnaires.

Statistical analyses

The data was analyzed using IBM Statistical Package for Social Sciences (version 22.0). Logistic regression was used to analyze predictors of SAM usage. Questionnaire responses were analyzed and interpreted using percentages. Cronbach's α for the Usability and Usefulness questionnaire was 0.85 (for Usability items) and 0.76 (for Usefulness items) which demonstrated acceptable internal consistency.

Results

Patient characteristics

Between the months of February to July 2016, inclusive, there were 36 patients admitted to the NPU who had behaviors monitored using SAM. Of these, 22 were male (60%), with a median age of 29 and age range from 29 to 72 years. The median admission duration was 12 +/- 8 days. Patient diagnoses were made using the DSM-IV criteria for psychiatric disorders and the appropriate criteria

This article is protected by copyright. All rights reserved.

Author Manuscript

for the various dementias (e.g. NINDS-ADRDA for Alzheimer's dementia and the Rascovsky criteria for behavioral-variant frontotemporal dementia).[15, 16] There were 20 patients (55%) who had a primary diagnosis of dementia. The Neuropsychiatry Unit Cognitive Assessment tool [17] was used to assess cognition for these patients. The mean score was 62.3 (SD 16.4), indicating moderate dementia. See Table 1 for the demographic information.

Acceptance questionnaire

There were nine nurses who were initially trained by one of the authors (SW) who completed this questionnaire one month after SAM was being used. All of them stated they were confident in using SAM and strongly agreed that it was straightforward to use. SAM administration time ranged from "less than a minute" to 5 minutes. All nurses reported that they preferred using the electronic medium compared to paper-based measure.

Feasibility of SAM use

Of the 200 shifts monitored, 21 were excluded due to confirmed Wi-Fi outages which restricted usage of SAM, leaving 179 shifts. SAM was used in 80 (45%) of these shifts. There were approximately four inpatients (mean 3.86, SD 1.39) and a mean nurse-to-patient ratio of approximately 1:3 in these shifts.

Sixty-one of these shifts (34%) were not staffed by regular nurses, but instead by agency nurses, who were not familiar with working in the NPU. SAM was used in only five of these shifts (8.2%). A chi-square test revealed that there was a significant difference in the usage of SAM between agency,

This article is protected by copyright. All rights reserved.

Author Manuscript

regular and bank nursing staff, χ^2 (1, N=179) = 51.3, p<0.001. Further inquiry into this revealed that "[agency staff] were sometimes told to use SAM, but seemed to forget to do so".

Thus, excluding the agency shifts, there were 118 shifts (58 morning and 60 afternoon) and SAM was used in 76 of these (64%). Using Fisher's exact test and logistic regression to compare SAM usage and predictors of usage found no significant associations (see Table 2).

Behavioral data

Across the 36 patients, 22 behaviors were chosen to be monitored by nursing staff, including behaviors included in the NPI and a number of nurse-nominated behaviors (such as "Confusion" and "Refusal") (Table 3). Each patient had a mean of three behaviors monitored (mean 3.2, SD 2.3, range 1 to 8). Five patients had all their behaviors rated as 0 for their entire admission. Agitation, anxiety and depression were the most frequently selected behaviors. In patients with dementia diagnoses, agitation, anxiety and confusion were the most frequently selected behaviors to be monitored.

Usability and usefulness for nursing staff

In order to explore key components of the TAM, the Usability and Usefulness questionnaire was administered to 11 regular nurses following five months of SAM use. These included two associate nurse unit managers (ANUMs), five registered psychiatric nurses and four graduate nurses. Of these, seven were female. Their ages ranged from 22 to 62, with a median of 26 +/- 9 years. Correlational analyses of the items and age showed a significant association between age and the response "I

This article is protected by copyright. All rights reserved.

Author Manuscript

needed the support of a technical person to use SAM", r(11), 0.75, p=0.008. The majority of nursing staff reported finding SAM easy-to use and useful (see Table 4 for details of responses).

Usefulness for specialist staff

The specialist staff were administered the Usefulness section of the Usability and Usefulness questionnaire at the conclusion of the trial. There were six questionnaires distributed and four (two psychiatry registrars and two neuropsychologists) returned these (response rate 66.7%). All of them reported that SAM was useful, that the data generated was relevant to them and improved the quality of their work. Open-ended responses about the benefits of using SAM included that the graphs (see Figure 2) "are a good visual representation of the behavior", "give a holistic picture of problem behaviors" and "often generate discussion around big changes in behavior". Data which was entered into SAM were discussed at clinical reviews and ward rounds with treatments altered accordingly. For example with Figure 2, it can be observed that the behavior Anxiety appeared related to higher levels of Occupational Disruptiveness. With regards to SAM overall, notable responses were "[SAM] can guide [us] on how to manage behaviors pre-emptively" and "understanding the frequency and circumstances of challenging behaviors is vital to provide proper behavioral management to clients and their families".

Discussion

This paper reports a pilot study of SAM, an electronic, web-based assessment for monitoring behaviors based on the NPI, in an inpatient psychiatric assessment unit. The major objective was to investigate whether SAM addressed the limitations of previous assessment methods, using the TAM.

This article is protected by copyright. All rights reserved.

Author Manuscript

The hypotheses were all supported - SAM was reported to be acceptable by nursing staff, easy-to-use, and added useful clinical information for nursing staff and specialist staff.

With regard to acceptance, within one month, all the regular nurses were confident in using SAM. Using SAM took minimal time and required minimal ongoing support. The TAM investigated perceived usefulness and perceived ease of use. The majority of nurses found SAM easy-to-use *and* useful, thus fulfilling both aspects of the TAM and suggesting that nurses did accept SAM.

A previous review of nurses and their acceptance of healthcare technology reported that perceived ease-of use sometimes directly predicts technology acceptance among nurses, but not always.[18] Hence if a technology is reported to be easy to use by nurses, they are more likely to accept and intend to use it. The reasons that ease of use does not always predict acceptance are not known, but in this study, one of the nurses did request extra assistance in using SAM, so the availability of ongoing support may be important.[19, 20] In this study, at least one of the authors was available during weekdays, during usual working hours, and was present to provide support as it was required.

Strudwick[18] also reported findings that were consistent with this study in that nurses perceived usefulness as a direct predictor of technology acceptance. A technology is seen as useful if it improves patient safety, carer quality and increases efficiencies,[18] and both the nursing and specialist staff in this study reported positive feedback that SAM helped them with their care of the patients, which may lead to continual usage of SAM.

This article is protected by copyright. All rights reserved.

Author Manuscript

Kirkley and Stein[20] made other suggestions which may assist with the uptake of new technology by nurses. These included the provision of appropriate hardware, keeping the "screens" of websites simple and minimal, and having a number of devices in convenient locations. These recommendations were considered in the design of SAM, and its implementation.

Regarding work flow, it has been reported that a barrier for nurses to use new technology is a perception that it will increase their workload.[20] However, in this study SAM was used regardless of nurse-to-patient ratios. SAM was not used only during shifts when there were Wi-Fi problems and staff who were unfamiliar working on the NPU (and hence use of SAM). Apart from lack of internet connection, other factors related to the actual technology such as lack of devices and concern about privacy which have been cited as barriers previously,[21] were not noted by staff to be a concern in this study.

There were several limitations to this study. There was only a small number of staff who were involved using SAM, thus limiting predictive associations. The sample size of respondents to the questionnaires was small (although there were only a limited number of specialist staff working in the NPU), and only 55% of the patients had formal diagnoses of dementia, somewhat limiting the extrapolation to care of people with dementia. However, there were patients included with a range of diagnoses and a range of challenging behaviors which suggested that SAM can be useful for monitoring all types of behaviors, regardless of the etiology.

Although SAM was based on the NPI, which is a valid and reliable measure, an evaluation of inter-rater reliability could be undertaken. There was no "gold standard" used to assess the criterion

This article is protected by copyright. All rights reserved.

Author Manuscript

validity of SAM. Additionally, while an advantage of SAM was the availability of entering custom symptoms (e.g. “confusion”) to be rated, future research might evaluate whether these can be reliably rated by different nursing staff despite potentially varying interpretations.

With regard to nursing staff, this study demonstrated that there was increased usage of SAM when regular staff were working at the NPU, and training bank and agency staff with emphasis on the importance of SAM reporting as a core duty might facilitate monitoring of behaviors and address the issue of behaviors not being monitored adequately when regular staff are not working.[10] Individual factors related to the nurses themselves such as personality traits which may affect acceptance of SAM could be investigated. Traits such as optimism and insecurity have been reported to influence usability and usefulness positively and negatively, respectively.[22] Previous experience using specific devices may also predict acceptability.[20] Using SAM in different settings such as in residential facilities or in the home may also provide more information whether carers have increased efficacy and improved coping skills if they feel more empowered and better able to manage their family members’ behaviors.

Nevertheless, this pilot study provided several useful lessons and suggested that an internet-based website SAM, was a feasible, acceptable and useful tool to quickly enter and share observations and information with all members of the health-care team. SAM provided real-time and contextual information about challenging behaviours in dementia and other psychiatric disorders. Subsequent feedback from the staff involved have been considered in order to improve this website. This website may be used to increase the quality, safety, and consistency of patient care by providing nurses and the specialist staff who make clinical decisions quick and easy access to clinical

This article is protected by copyright. All rights reserved.

Author Manuscript

information. It thus may assist in the provision of individualized information for the implementation of strategies to manage challenging behaviors.

Acknowledgements: This study could not have been possible without the efforts of the nursing staff at the Neuropsychiatry Unit and the staff who completed questionnaires. NorthWestern Mental Health seed provided some funding for this project.

Please contact the Corresponding author with inquiries about SAM and information about potential usage.

Author Manuscript

This article is protected by copyright. All rights reserved.

Table 1.Patient information

Primary diagnosis	Frequency (%)	Mean age in years (SD)	Mean NUCOG total (SD)
Alzheimer's dementia	6 (16.7)	55.5 (5.79)	54.5 (18.7)
Huntington's disease	4 (11.1)	48.3 (10.9)	59.3 (12.6)
Vascular dementia	3 (8.3)	61.6 (5.3)	69.8 (17.3)
Frontotemporal dementia	2 (5.6)	54.1 (16.0)	73.8 (8.84)
Other dementias	5 (13.9)	63.7 (9.1)	64.8 (17.8)
Schizophrenia	2 (5.6)	57.3 (3.2)	72.0 (11.3)
Depression	7 (19.4)	59.4 (5.2)	84.5 (6.57)
Other psychiatric illnesses*	7 (19.4)	57.2 (13.9)	83.0 (11.1)
TOTAL	36 (100)	57.8 (10.0)	54.5 (18.7)

SD standard deviation

NUCOG Neuropsychiatry Unit Cognitive Assessment tool

*Other psychiatric conditions included bipolar disorder and anxiety

Author Manuscript

This article is protected by copyright. All rights reserved.

Table 2. SAM usage and potential predictors of usage

Results of SAM usage comparisons with potential predictors of usage

	All nurses (N= 179 shifts)		Regular nurses (N= 118 shifts)	
Independent Variable	Test statistic	p value	Test statistic	p value
Type of Day (weekday-end)[a]	.930	.397	.183	.669
Shift Time (a.m.- p.m.)[a]	1.11	.367	.974	.324
Nurse-to-patient ratio[b]	11.21	.118	10.0	.145
Number of inpatients[c]	Exp (B) = .693	.790	Exp (B) = .912	.629
Number of rostered nurses[c]	Exp (B) = 1.14	.741	Exp (B) = 2.50	.097
Number of admissions[a]	1.90	.168	.507	.476

a. Chi-square analysis (categorical data)

b. Fisher's Exact test (nonparametric categorical data)

c. Logistic Regression analysis (continuous data, with categorical dependent variable)

SAM Symptom Assessment Manager

Author Manuscript

This article is protected by copyright. All rights reserved.

Table 3. Frequencies of behaviors chosen to be monitored in SAM

Behavior	Frequency in all patients (n=36)	Frequency in patients with dementia (n=20)
Agitation	15	9
Anxiety	16	8
Apathy	5	3
Confusion *	9	8
Delusions	5	1
Demanding *	6	5
Depression	11	4
Disordered movements *	5	2
Hallucinations	3	1
Inappropriate behavior *	5	2
Mood lability *	4	2
Other	7	5
Perseveration *	1	0
Physical aggression *	5	4
Refusal *	6	3
Sexual disinhibition	7	5
Verbal aggression	5	4
Wandering	2	2

SAM Symptom Assessment Manager

*not in the Neuropsychiatric Inventory – nominated by nursing staff

Author Manuscript

This article is protected by copyright. All rights reserved.

Table 4. Usability and usefulness questionnaire – nursing staff (n=11)

STATEMENT	SD	D	N	A	SA
I would like to use SAM frequently		9%	27&	55%	9%
I found SAM unnecessarily complex	9%	73%	9%	9%	
I thought SAM was easy to use			18%	45%	36%
I needed the support of a technical person to be able to use SAM	18%	55%	18%	9%	
I found the functions in SAM to be well-integrated				82%	18%
I found SAM too inconsistent		55%	27%	18%	
I think that most people would learn to use SAM very quickly			9%	55%	36%
I found SAM very cumbersome to use	27%	36%	27%		
I felt very confident using SAM		9%	9%	36%	45%
I needed to learn a lot of things before being able to use SAM	18%	82%			
Using SAM improves the quality of the work I do	9%		45%	45%	
Using SAM does not improve my patient care	18%	54%	9%	9%	
SAM supports critical aspects of nursing			27%	36%	36%
SAM decreases my productivity	27%	54%		18%	
Using SAM makes my patient care and management easier		18%	27%	36%	63%
I found SAM useful			18%	63%	18%

Questions 1-10 pertain to Usability; questions 11 – 16 pertain to Usefulness

SAM Symptom Assessment Manager

SD strongly disagree

D disagree

N neutral

A agree

SA strongly agree

Author Manuscript

This article is protected by copyright. All rights reserved.

References

1. Cerejeira, J., L. Lagarto, and E.B. Mukaetova-Ladinska. Behavioral and Psychological Symptoms of Dementia. *Frontiers in Neurology*, 2012; 3: 73.
2. Sampson, E.L., et al. Behavioural and psychiatric symptoms in people with dementia admitted to the acute hospital: prospective cohort study. *The British Journal of Psychiatry*, 2014; 205(3): 189-196.
3. Karttunen, K., et al. Neuropsychiatric symptoms and quality of life in patients with very mild and mild Alzheimer's disease. *International Journal of Geriatric Psychiatry*, 2011; 26(5): 473-482.
4. Savaskan, E., et al. Recommendations for diagnosis and therapy of behavioral and psychological symptoms in dementia (BPSD). *Praxis*, 2014; 103(3): 135-148.
5. van der Lee, J., et al. Multivariate models of subjective caregiver burden in dementia: a systematic review. *Ageing Research Reviews*, 2014; 15: 76-93.
6. Fischer, C.E., Z. Ismail, and T.A. Schweizer. Impact of neuropsychiatric symptoms on caregiver burden in patients with Alzheimer's disease. *Neurodegenerative Disease Management*, 2012; 2(3): 269-277.
7. McKenzie, G., et al. Reactions of assisted living staff to behavioral and psychological symptoms of dementia. *Geriatric Nursing*, 2012; 33(2): 96-104.
8. Livingston, G., et al. Systematic review of psychological approaches to the management of neuropsychiatric symptoms of dementia. *American Journal of Psychiatry*, 2005; 162(11): 1996-2021.
9. Gitlin, L.N., et al. Assessing neuropsychiatric symptoms in people with dementia: a systematic review of measures. *International Psychogeriatrics*, 2014; 26(11): 1805-1848.
10. Loi, S.M. and N.T. Lautenschlager. Investigating the current methods of assessing behavioral and psychological symptoms in residential aged care facilities in a metropolitan city. *International Psychogeriatrics*, 2017; 29(5): 855-858.
11. Aggelidis, V.P. and P.D. Chatzoglou. Using a modified technology acceptance model in hospitals. *International Journal of Medical Informatics*, 2009; 78(2): 115-126.
12. Hu, P.J., et al. Examining the technology acceptance model using physician acceptance of telemedicine technology. *Journal of Management Information Systems*, 1999; 16(2): 91-112.
13. Cummings, J.L., et al. The Neuropsychiatric Inventory comprehensive assessment of psychopathology in dementia. *Neurology*, 1994; 44(12): 2308.
14. Duffield, C., M. Roche, and E.T. Merrick. Methods of measuring nursing workload in Australia. *Collegian*, 2006; 1(13): 16-22.
15. McKhann, G., et al. Clinical diagnosis of Alzheimer's disease Report of the NINCDS-ADRDA Work Group* under the auspices of Department of Health and Human Services Task Force on Alzheimer's Disease. *Neurology*, 1984; 34(7): 939-939.
16. Rascovsky, K., et al. Sensitivity of revised diagnostic criteria for the behavioural variant of frontotemporal dementia. *Brain*, 2011; 134(9): 2456-2477.
17. Walterfang, M., R. Siu, and D. Velakoulis. The NUCOG: validity and reliability of a brief cognitive screening tool in neuropsychiatric patients. *Australian and New Zealand Journal of Psychiatry*, 2006; 40(11-12): 995-1002.
18. Strudwick, G. Predicting nurses' use of healthcare technology using the technology acceptance model: an integrative review. *CIN: Computers, Informatics, Nursing*, 2015; 33(5): 189-198.

This article is protected by copyright. All rights reserved.

Author Manuscript

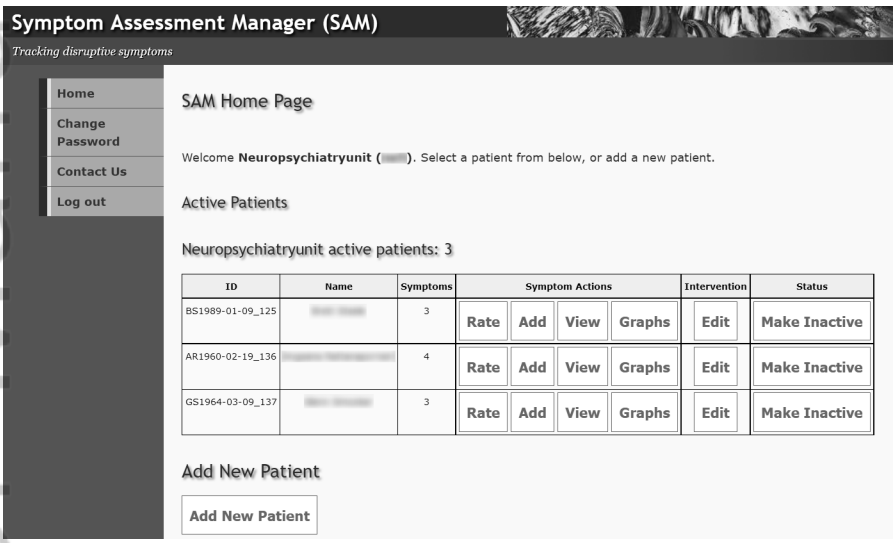
19. Huryk, L.A. Factors influencing nurses' attitudes towards healthcare information technology. *Journal of Nursing Management*, 2010; 18(5): 606-612.
20. Kirkley, D. and M. Stein. Nurses and clinical technology: sources of resistance and strategies for acceptance. *Nursing Economics*, 2004; 22(4): 216.
21. Koivunen, M., A. Niemi, and M. Hupli. The use of electronic devices for communication with colleagues and other healthcare professionals–nursing professionals' perspectives. *Journal of Advanced Nursing*, 2015; 71(3): 620-631.
22. Kuo, Y.F., M.A. Raji, and J.S. Goodwin. Association between proportion of provider clinical effort in nursing homes and potentially avoidable hospitalizations and medical costs of nursing home residents. *Journal of the American Geriatrics Society*, 2013; 61(10): 1750-1757.

Figure 1. Symptom Assessment Manager home page [URL www.cerescape.com/sam/]
Figure 2. Example of individual Symptom Assessment Manager Occupational Disruptiveness graph

Author Manuscript

This article is protected by copyright. All rights reserved.

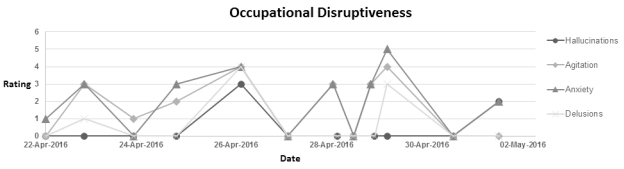
Author Manuscript



GPS_4820_F1.tif

This article is protected by copyright. All rights reserved.

Author Manuscript



GPS_4820_F2.tif

This article is protected by copyright. All rights reserved.