TITLE PAGE

i. Debriefing immediately after intubation in a children's emergency department is feasible and contributes to measurable improvements in patient safety

ii. DEBRIEFING IMMEDIATELY AFTER INTUBATING CHILDREN

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Debriefing immediately after intubation in a children's emergency department is feasible and contributes to measurable improvements in patient safety

Abstract

Objectives: In 2013, our intubations highlighted a safety gap - only 49% achieved first pass success without hypoxia or hypotension. NAP4 recommended debriefing after intubation, but limited published methods existed. Primary aim: to implement a feasible process for immediate debriefing and feedback for emergency airway management. Secondary aims: to contribute to reduced frequency of adverse intubation-related events and implement qualitative improvements in patient safety through team reflection and feedback.

Methods: A component of a prospective quality improvement (QI) study over 4 years in the Emergency Department of The Royal Children's Hospital, Melbourne, Australia. Debrief and feedback after intubation was one of seven study interventions. Targeted staff training and involvement of departmental leaders occurred. A post-intervention cohort was audited in 2016. Analysis included the Team Emergency Assessment Measure.

***Results*:** Immediate post-event debriefing occurred in 39/46 (85%) intubations. Debriefing was short (median duration 5 minutes, IQR 5,10) and soon after (median 20 minutes, IQR 5, 60). Commonest location was the resuscitation room (92%), led by the team leader (97%). Commonest barrier preventing immediate debriefing was excessive workload. Two QI process measures were assessed during debriefing (adequate resuscitation, airway plan) and case summaries distributed for 100% of intubations. Performance outcomes included contribution to 78% first pass success without hypoxia or hypotension. Team reflection prompted changes to environment (signage, stickers), training (skill drills), teamwork and process (communication, clinical event debriefing).

Conclusions: Structured and targeted debriefing after intubating children in the ED is feasible and contributes to measurable and qualitative improvements in patient safety.

Keywords: *child, clinical debriefing, intubation, patient safety, team reflection*

Introduction

In 2013 an audit of intubation in our Paediatric Emergency Department (ED) identified a safety gap - only 49% achieved first pass success without hypoxia or hypotension. To bridge this gap, The Fourth National Audit Project of complications of Airway Management in the United Kingdom made several recommendations for governance, including debriefing after intubation.[1] We did not know if it was feasible to achieve a high debrief rate in a busy emergency department, nor if it actually improves airway management outcomes.
The primary aim was to implement a feasible process for immediate debriefing and feedback for emergency airway management. Secondary aims were to contribute to reduced frequency of adverse intubation-related events, and implement qualitative improvements in patient safety through team reflection and feedback.

Background

Hypoxia and hypotension occur in up to one third of emergency intubations outside of the operating room,[2] are associated with poor neurological outcomes, and are predictors of airway-related death. [3-5] Multiple intubation attempts are associated with hypoxia during emergency intubation.[6] Therefore, the gold standard for emergency intubation is successful first pass intubation without hypoxia or hypotension.

Since inception, our Emergency Department developed a culture and language around debriefing and feedback of real and simulated events. This may be related to it's origins in

developing APLS Australia,[7] but also the desire for our staff to discuss paediatric resuscitations.[8] Brief, verbal, After Action Reviews such as those conducted in WW2 by US Army Brigadier General Marshall[9] could be described as part of our standard departmental language. Since 2012, we had used a structured form and approach for clinical event debriefing of cardiac arrests - the form was used in an ad hoc fashion otherwise. This study was recognised as an opportunity to develop and benefit from the culture of debriefing that already existed.

In 2014, limited published studies existed on how to conduct clinical event debriefing within the ED. Mullan *et al* reported challenges in implementation, with 23% of intubations and 26% of resuscitations debriefed.[10] Mullan *et al* had adapted the Team Emergency Assessment Measure (TEAM), a validated tool for rating medical emergency teamwork performance, [11] which suited our environment.

In 2015, The European Resuscitation Council and American Heart Association recommended debriefing after resuscitations to improve performance, raising the profile for this intervention.[12-13] Practical guides for debriefing in-situ Emergency Department events began to appear.[14]

Methods

Setting

The Emergency Department of The Royal Children's Hospital, Melbourne, Australia, a quaternary level paediatric (0-18 years of age) hospital, with an annual census of >90 000 presentations.

Intervention design: Debrief form and process development

A pre-intervention cohort in 2013 identified intubation safety gaps. Over the next 2 years, seven study interventions were designed in a Quality Improvement (QI) initiative in emergency airway management.[15] One of these interventions was an immediate structured debrief and feedback after every intubation. An overarching principle was to promote team reflection and feedback several ways to promote measurable and qualitative safety improvements.

Published tools and guides to clinical event debriefing[10,14] informed our process and form (Figure 1) (https://www.rch.org.au/clinicalguide/guideline_index/Emergency_airway_management/) The intervention assessed two key process measures for the QI project: presence of a clear intubation plan, and adequacy of resuscitation prior to intubation. These were designated on the form as "Intubation priorities" along with an additional priority- to address fixation error. It was designed to be rapid (10 minutes) - based on staff feedback and existing literature[14] this facilitated completion. It recorded attendees and roles to aid analysis of team function and facilitate follow up. It included structured debriefing informed by the principles outlined by the Centre for Medical Simulation[16] and PEARLS[17] including reactions, case summary, human factors and technical aspects in a plus (done well) /delta (improve next time) format, then three takeaway messages. As it was anticipated not all staff would attend the debrief, it was planned to contact them by email to offer opportunity for feedback. Case summaries were to be distributed to the entire department and all participants. Themes were explored in departmental meetings eg. morbidity and mortality meetings. This overall method aimed to reinforce good practice and identify patient safety issues. As we expected unanticipated risks and benefits, we determined to respond and enact solutions as a dynamic process. To address psychological first aid, we planned the department's longstanding

approach of an informal check in to ensure staff were ok, with follow up and support referrals as needed.

Implementation

In 2014-15 we developed this debriefing and feedback intervention with involvement of senior ED staff and the hospital Airway Group. Staff targeted for training included Medical Consultants, Fellows, Registrars; Senior Nursing (Nurse Educators, Managers) and Nurse Practitioners. Structured training included short courses in Debriefing Real and Simulated Clinical Events or in Multidisciplinary Simulated Airway Courses (2-4 hours), with exposure to the principles and process of immediate debriefing. All staff involved in ED airway management were informed of this intervention via email, signage, bulletins and various staff forums. As feedback was obtained the debriefing form and feedback process were refined.

A post-implementation cohort of every intubation in the 2016 calendar year monitored the debriefing and feedback outcomes and informed case summaries and impact on intubation process and outcomes. The study was approved by the hospital's Human Research Ethics Committee (32250A).

Data collection and analysis

Data were collected on the debrief form (Figure 1) by team members at the time of post intubation debriefing, and by investigators at email follow up to all team members. Data were entered and analysed with Microsoft Excel 2010 (Microsoft, Redmond, WA, USA). TEAM[11] was adapted to categorise the three takeaway messages into themes to inform quality improvement solutions.

Results

Debriefing feasibility

Immediate debriefing occurred in 39/46 (85%) intubations. Debriefing was short (median duration 5 minutes, IQR 5,10 minutes) and soon after intubation (median time 20 minutes, IQR 5, 60 minutes). The commonest location was the resuscitation room (92%) after the patient had left. It was most commonly led by the event team leader (97%), and a doctor (97%). The commonest barriers to not performing a debrief (15%) were that it was the middle of the night and staff said “due to minimum staffing and high workload it was not possible to conduct a debrief”, on another occasion there were multiple patients requiring intubation simultaneously including a post-arrest trauma patient and staff said “workload was such that staff were overloaded and unable to perform multiple debriefs”.

Non-emergency staff present at 8 debriefs (21%) were predominantly paediatric intensive care unit (PICU) staff. All staff present at all 46 events but absent from an immediate debrief were contacted by the investigators to close the gap on missing feedback. Case summaries were distributed to the entire emergency department in 100% of intubations, including those unable to attend the immediate debrief. The two key process measures for the associated QI project were addressed in 100% of intubations, the three intubation priorities in 99% of debriefs. (Table 1)

Measurable safety outcomes

This debriefing intervention contributed to the adverse event reduction during intubation for the associated QI project where the first pass success rate without hypoxia or hypotension was 78% in the post-intervention cohort compared to 49% in the pre-intervention cohort.[15]

Qualitative safety outcomes from team reflection and feedback.

Three takeaway messages for each debrief were categorised and demonstrated that the commonest themes emerging in plus and delta (85%) included the importance of: clear leadership including crowd control; role clarity for team members; use of an airway checklist; and the importance of communication/coordination between airway practitioner and assistant. (Table 2).

Department leaders acted on this feedback. Safety measures implemented included Crowd Control measures such as signage and red lines on the floor of resuscitation room entry, Role Clarity Stickers with written names, and daily short Airway Drills to improve team competence for real events. An increasing proportion of plus to delta takeaway messages as the year progressed reflected that the teams' own perception of performance improved over time. (Figure 2).

Team feedback addressed our current clinical event debriefing process and prompted our current form (Figure 3). It reinforced we were correctly addressing learning and quality improvement outcomes and this remained unchanged. It highlighted a need to clarify how we addressed psychological first aid, so we added a pre-brief, check in and flagging the time of the planned debrief, with an opt out approach. Reference to managers and formal organizational programs for distressed staff requiring psychological debriefing was added.

Discussion

Given 85% of intubations were immediately debriefed, we conclude immediate post-event debriefing is feasible. This is comparatively higher than 23% across one year with the DISCERN tool,[10] and similar success to that achieved by Rose and Cheng with the INFO tool.[18] A useful additional adjunct to enhance learning and QI are case summaries - distributed in 100% of intubations.

Reasons for the successful implementation and feasibility of post intubation debriefing include departmental culture, where it is “Expected and Accepted” that we will debrief events as “normal process”, not just because “something went wrong”. Staff were engaged in the process - staff like it and want it, are aware of the risks of ad hoc, non-facilitated debriefing that may not include critical team members, occur in professional silos, and lack critical information.[19] Staff saw tangible and rapid QI changes eg. red lines on the floor of the resuscitation room. There was a sense that “speaking up leads to action and solutions” which reinforced feedback behaviour. The distribution of case summaries including discussion at morbidity and mortality meetings facilitated learning and engagement by all staff. The choice of intubation as the event to debrief was important in the context of our environment- as this was once per week, debriefing was not so frequent it became a burden, but not so infrequent that staff remained in the habit. As part of a larger QI initiative for an infrequent high stakes clinical event, the debrief had a high profile which may have aided uptake.

The debrief duration of 5 minutes was shorter than planned and reinforced the belief that this was not too onerous - that staff could manage it within normal workload - an important barrier to overcome in hot debriefs.[14] The scripted tool and training facilitated this.
The debrief occurred about 20 minutes later, approximately the time it took to prepare the resuscitation room for the next patient. Being so soon after the event, staff likely had good recall, as reported by Mullan *et al*.[20] This also had the advantage of bringing the team together while still on the same shift, avoiding the barrier of assembling the same team of shift workers at a later date.[10,21]

Staff liked using the resuscitation room as the location for the debrief as they did not need to leave the clinical environment, minimising risk to other patients. It provided enough privacy to discuss cases and easy review of environment.

Facilitators were doctors most of the time, 74% consultant physicians. This was in contrast to the INFO model[18] which found that charge nurse facilitators rather than doctors (DISCERN model) improved uptake. This was not planned, as both senior nursing and medical staff had training and capability to lead debriefs. In our intubations, senior nurses were always present, eg as scribes or charge nurses outside the room keeping oversight of the ED. Debriefs did or did not occur after consultation between the senior doctors and nurses as to the appropriateness of conducting it in the context of the entire ED situation, so although the form may reflect who "led" the discussion, in truth all senior staff influenced the feasibility. The debrief lead was assigned prior to intubation as part of the intubation checklist.[15] Almost all were the team leader (TL), likely because they were a senior staff member who felt equipped to conduct it. While the TL benefited from situational awareness and ability to summarise the case, there were risks. If things needed to be improved, it may be challenging to address this as the TL, who often assumes responsibility for what happened. Cognitive overload is a risk. Despite this, the TL's were able to conduct effective debriefs.

Non-emergency staff presence at debriefs was highly valued and contributed to a community of practice. This included ambulance staff who found involvement in clinical event debriefs helpful, particularly to complete the clinical picture and seek feedback on pre-hospital care.

Regarding impact on measurable outcomes, measurable improvements in CPR by debriefing has a growing body of evidence.[22-24] Whilst this study demonstrates that structured and

targeted debriefing as part of a QI bundle can contribute to measurable improvements in the safety of paediatric emergency intubation, further study would be needed to define the measurable effect of debriefing *alone* on intubation safety

Regarding impact on qualitative outcomes, we were surprised by how effectively the TEAM analysis organised into themes enabled the rapid emergence of our safety gaps and modifications to our environment. Rapid Cycle Deliberate Practice in a 10-minute airway skill drill for our resuscitation team each morning was implemented in response to the communication and checklist performance gaps. The contribution to improving our clinical event debriefing form was welcomed. It is an example of "melded" clinical event debriefing scripts emerging in the literature.[25] These are examples of what has been termed Post-action Team Reflexivity in healthcare, "By deliberately reflecting about past situations and evaluating their actions, teams can minimize similar future mistakes and expressly identify and reinforce positive behaviours".[21]

As teams become more competent, their performance improves. Although we did not measure this, figure 2 shows that as the year progressed, teams *perceived* their performance improved. This invites further study of team performance perhaps through a Team Reflexivity or Relational Coordination lens.[21,26]

Limitations

Limitations included the inability of staff to attend a debrief due to inevitable workload - some staff are left "holding the baby", particularly PICU in our setting. This was addressed by sending emails to staff, incorporating their feedback and sharing case summaries.

It is possible staff did not fully feedback their thoughts due to the short time of the debrief, and concern of creating conflict, particularly when emotions may be still heightened. We aimed to mitigate this with a culture of respectful feedback, a common language and

structured approach, and the follow up opportunity for written feedback with anonymity and time to process the event.

Conclusion

Immediate debriefing in the resuscitation room after emergency intubation is feasible when conducted by senior staff with appropriate training, structure, tools and support. Debrief as an intervention can be used to address key process measures of QI projects in time-critical, high-acuity clinical environments to contribute to measurable improvements in frequency of adverse events. Team reflection and feedback can address safety gaps, inform changes to environment, equipment, teamwork and highlight good practice.

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Conflicts of interest: None

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Table 1. RCH The who, where, how and when of debriefing all intubations in 2016

Measure	Number	%
Intubations	46	100
Debriefs	39	85

Debrief Leader:		
Consultant	29	74
Fellow	6	15
Registrar	3	8
Nurse Manager	1	3
Resuscitation Team Leader	38	97
Non-Emergency Staff presence at Debrief	8	21
Debrief Location:		
Resuscitation Room	36	91
Resuscitation Waiting Room	1	3
ED Staff Room	1	3
ED Procedure Room	1	3
Two QI Process measures assessed	46	100
Case Summaries Distributed	46	100
Three Intubation Priorities addressed	116	99
Timing	Time (Minutes)	Interquartile Range (minutes)
Median Duration of Debrief	5	5,10
Median Time after Event	20	5,60

Table 2: TEAM themes applied to narrative survey data and commonest themes highlighted *

Adapted TEAM themes	Examples of Plus Comments	Examples of Delta Comments
A. Leadership		

1.Leadership control (includes crowd control)*	"Recaps and sharing the mental model good" "early recognition and sharing the mental model this was septic shock helped" "it was quiet"	"we need less people walking in and out" "tell people outside the room to be quiet" "be assertive as the team leader"
B. Team Work		
1.Communication*	"closing the loop helped make it safer" "a calm uncrowded room aided communication and performance of the airway doctor"	"Team Leader (TL) and scribe should share info to ensure nothing missed" "communicate through the TL especially to external departments"
2.Co-operation or co-ordination*	"it felt like PICU and ED were the same team" "airway skill drill this morning helped team function"	"the airway doctor and nurse should use language to avoid misunderstanding- 'take the bougie' doesn't mean 'take out the bougie'"
3.Team climate (includes morale)	"positive atmosphere in the team helped"	
4.Adaptability (includes role clarity)*	"staff entering identified self to team leader" "clear role allocation despite a large trauma team"	"team changes should prompt checking of team roles for clarity"

		"with two PICU doctors we didn't know their roles"
5.Situational awareness (includes anticipation)	"being certain of the indication to intubate prior to commiting showed good situational awareness"	"the team leader lost situational awareness when they took on two roles at once, stay hands-off"
C.Task Management		
1.Prioritisation	"resuscitate prior to induction"	"safe transfer to PICU requires certain tasks to be completed prior"
2.Clinical Standards (including checklist use)*	"Apnoeic ox via nasal prongs can prolong safe intubation time, prompted by checklist"	"use the checklist to make things easier" "if a patient deteriorates after arrival activate the trauma team"
D.Environment		
Equipment or environment	"using the template to select correct size equipment helps a lot"	"a system to improve inotrope infusion is needed" "a skill gap exists in fixing the tube to prevent accidental extubation, we need more training"

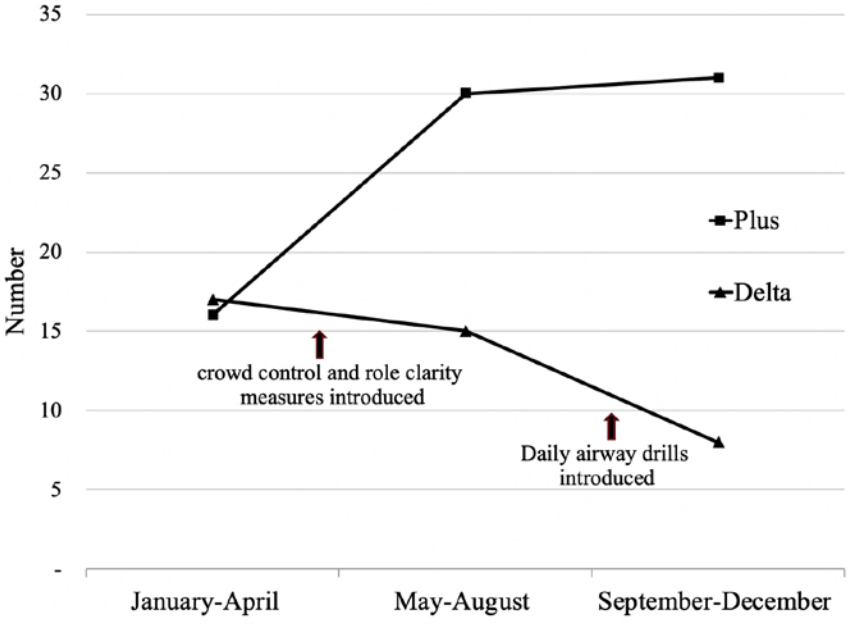
Figure Legends

Figure 1. RCH emergency airway management debrief form

Figure 2. Team reflection resulting in safety measures, and their relationship to an increasing proportion of plus v delta takeaway messages as the year progressed.

Figure 3. Real and simulated clinical event debrief form current version

Appendices: Nil



DEBRIEFING SIMULATED AND REAL CLINICAL EVENTS IN THE EMERGENCY DEPARTMENT

- *Immediately after a KISS (Keep it Simple Simulation)* ***OR***
- *After Real Clinical Events when appropriate eg intubation, cardiac arrest. After these* ***state*** *"There will be a team debrief commencing in the next 20 minutes, the purpose is to improve quality of patient care. You are welcome to participate but it is OK to opt out."*

Ask/Check: "Is everyone OK?" If YES, continue. If not, defer debrief (see below)

State: "The purpose of this 5-minute debrief is to improve quality of patient care"

Ask: "What happened medically to the patient?" (Write Clinical Case)

Ask: "What went well?" **PLUS**	Ask: "What can be improved next time?" **DELTA**
Human Factors Technical	Human Factors Technical

Key Take away points (can be plus or delta for human factors, technical, systems)

1

2

3

If deferring debrief or anyone needs or requests counselling: notify manager and refer to EAP 1300 687 327

Date:

Duration:

Debrief Leader:

Human factors/ Non-Technical Skills

1. Leadership/Followership- share the mental model, make decisions
2. Effective communication-through the leader, close the loop
3. Call for Help 4. Utilise resources 5. Maintain situational awareness

Return form to ED Simulation Team

Emergency Airway Management Debrief Form

The Royal Children's Hospital Melbourne

Anaesthesia, PICU, NICU, and Emergency

Debrief — Quick (10 mins) immediately after clinical event

Role	Name	Speciality training	Grade
Team leader		ED/Anaesthetics/Paeds/ICU	Cons/Fellow/Reg
Scribe			
Airway nurse		ED/Anaesthetics/Paeds/ICU	
Airway doctor		ED/Anaesthetics/Paeds/ICU	Cons/Fellow/Reg
Circulation nurse		ED/Anaesthetics/Paeds/ICU	
Circulation doctor		ED/Anaesthetics/Paeds/ICU	Cons/Fellow/Reg
Other			
Other			

Debrief lead name:	**Location of debrief:**
Duration of debrief: min	**Timing of debrief after event:** min
Ask: *'How did that feel?'*	**Ask:** *'What happened medically to the patient?'*
Ask: *'Were the 3 Intubation priorities below addressed?'*	

Could the patient have been resuscitated better prior to intubation?	◯ Yes ◯ No	Why?
Was there a plan for failed intubation?	◯ Yes ◯ No	Why?
Was there any fixation error on a specific aspect?	◯ Yes ◯ No	Why?

Ask: *'Overall what went well?'* **PLUS**	**Ask:** *'Overall what can be improved next time?'* **DELTA**
Human factors:	Human factors:
Technical:	Technical:

Three take away messages (can be technical, human factors, systems)

1.

2.

3.

Human factors	Curiosity advocacy-inquiry
1. Leadership/followership — share the mental model, make decisions	*'I saw/heard...'*
2. Effective communication — through the leader, close the loop	*'I think...'*
3. Call for help **4.** Utilise resources **5.** Maintain situational awareness	*'I wonder...'*

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