

# **ViCTOR Medical Emergency Response Metrics**

Victorian Managed Insurance Authority and  
Victorian Paediatric Clinical Network

Final Report June 2018



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## Preface

This report was prepared by the Victorian Children's Tool for Observation and Response (ViCTOR) project team for the Victorian Managed Insurance Authority (VMIA) and the Victorian Paediatric Clinical Network, Safer Care Victoria, Victoria, Australia.

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The ViCTOR team also gratefully acknowledges the contributions and support from the following:

- the Victorian Paediatric Clinical Network (VPCN) at Safer Care Victoria, particularly Paulette Kelly (former Manager), Associate Professor David Armstrong (Co-Clinical Lead), Dr Peter McDougall (Co-Clinical Lead)
- the ViCTOR Metrics Expert Advisory Group
- the 11 ViCTOR Medical Emergency Response Metrics pilot sites, in particular, the pilot site champions and executive staff
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## Executive summary

This report describes the development of a set of clinical deterioration metrics to inform a sustainable state wide monitoring framework for reporting paediatric clinical deterioration across Victorian hospitals. The Victorian Children's Tool for Observation and Response (ViCTOR) Medical Emergency Response Metrics Project is a quality improvement project funded by the Victorian Managed Insurance Authority (VMIA) and the Victorian Paediatric Clinical Network, Safer Care Victoria.

The project builds on previous work to develop and implement standardised observation and response charts for paediatric patients in Victorian health services. To date, 75 hospitals have implemented the ViCTOR charts, which facilitate early recognition of clinical deterioration and timely escalation of care through medical emergency teams (MET) and/or Code Blue systems.

The objectives of the project have been:

- To gain an understanding of current data collection and review processes in Victorian healthcare services
- To identify paediatric clinical deterioration metrics that will inform and support best practice and continuous improvement
- To develop a standardised tool for collecting paediatric clinical deterioration metrics in Victorian hospitals
- To pilot the data collection tool in metropolitan and regional Victorian hospitals that have implemented ViCTOR charts and evaluate it in terms of:
  - the utility of the tool and collection processes
  - the utility of the data for monitoring deterioration and assessing outcomes
  - the feasibility of ongoing data collection
- To use the collected data to gain an understanding of the population of hospitalised children who require a medical emergency response call, including the frequency, characteristics and outcomes for different hospitals
- To highlight opportunities that may be considered regarding a set of paediatric clinical deterioration metrics that could be routinely collected and analysed centrally within the Victorian healthcare system to support continuous improvement.

### Current data collection and review processes in Victoria

To better understand how health services are collecting and utilising medical emergency response data, a survey was distributed to 31 Victorian health services that treated paediatric patients. Half of the health services responded to the survey. All respondents indicated that they routinely collect data after a medical emergency call, and two-thirds indicated they use the same form for adult and paediatric patients. Most services reported that they collect data on a paper form before entering it into a database.



## Tool development and testing

The Australian Commission on Safety and Quality in Health Care (ACSQHC) recommends a number of quality measures that health services can use to review their processes and outcomes.

Based on these, as well as a consideration of current paediatric evidence, a review of existing forms, and consultation with the sector, including securing input from an Expert Advisory Group, a Medical Emergency Response form was developed. It included the following elements:

- location of call
- patient demographics
- pre-call events
- call details
- reasons for call,
- significant events and
- patient outcomes.

The form was piloted in six metropolitan and five regional hospitals over a five month period. Based on the data collected, two types of reports were provided to hospitals on a monthly basis; a combined summary for all participating sites, and an individual site report that enabled comparison of local data with the aggregate findings.

A multi-method evaluation explored the usability of the data, feasibility of maintaining ongoing data collection and the utility of benchmarking reports. The evaluation methods included audits of the 286 completed trial data collection forms, telephone interviews and focus groups.

## Evaluation findings

### Utility of the data fields for monitoring deterioration

Overall, the forms were completed well and there was very little missing data. The most frequent field that was not recorded was the time that the call finished (7.34%). This impacted the determination of duration of each call.

The majority of participants thought that all data fields were necessary for reporting patient deterioration. The most useful information included, the number of calls, location of calls, admission diagnoses, breaches of purple parameters, significant events and patient outcomes. Some of the pilot sites had tabled the summary reports at their deteriorating patient committee (or an equivalent committee). Others planned to share the data at their local paediatric clinical advisory group or mortality and morbidity meetings.



### **Refinement of the medical emergency response form**

Relatively minor amendments were made to the medical emergency response form. These included the addition of 'Yes' and 'No' boxes in some sections to improve clarity, moving a field to the bottom of the form to better reflect logical decision making and revision of the definition of fluid resuscitation to account for both routine fluid bolus and extensive fluid resuscitation. A new question was added to the bottom of the form 'Does this case require a more detailed review'. It provided an opportunity to capture any concerns regarding processes of care that warranted further investigation.

Some sites suggested that it would be useful to identify delayed escalation of care, or failure of clinical review processes including expanding the form to include all clinical reviews. It was agreed that this would increase the burden of work required by the medical emergency response or treating medical teams. It was more difficult to determine whether there had been a delay, or failure of urgent review processes, at the time of completing the form. It was considered that these aspects should be taken into account at subsequent case reviews.

### **Feasibility of ongoing data collection**

Overall, completion of the form was considered an easy task. It usually only took a few minutes to be completed by the bedside nurse or a member of the medical emergency response team. Concerns were raised regarding duplication of their local hospital medical emergency forms and how they would integrate the additional data elements into their own data bases. All pilot sites, except one, entered data from paediatric medical emergency calls into a locally designed data base or VHIMS module. Continuing to use the standardised form would require hospitals to integrate additional data elements into their own data bases. Several pilot sites suggested that a standardised paediatric module in VHIMS would be appealing.

### **Utility of benchmarking reports and measures suitable for benchmarking**

It was difficult to determine measures suitable for benchmarking, in part, because of the variability of the number of calls across sites, and due to the fact that different medical emergency response systems existed within each of the health services. Furthermore, the optimal rate of medical emergency response calls is unknown. Instead, the measures were considered most useful for individual organisations to enable reviewing of trends over time.

It was suggested that 'like hospitals' with similar casemix and characteristics could be grouped together and that quality measures could be shared amongst similar health services, as determined by the health service. One participant highlighted that the data should not be used to rank or penalise individual health services.

Two key process measures were proposed for health services to monitor:

1. The rate of medical emergency response calls as determined by the number of calls per 1000 patient separations or admissions.
2. The rate of transfers to a higher level of care (ED, HDU, ICU or another hospital) per 1000 patient separations or admissions.



## Characteristics and outcomes of hospitalised children who had a medical emergency call

The frequency, characteristics and outcomes of children who had a medical emergency call were summarized throughout the five month period. Although there was great variability in the number of medical emergency calls across sites, the findings provided important insights into the nature of paediatric clinical deterioration. There were 286 medical emergency calls that occurred across 10 pilot sites (range 1-164 calls per site). The monthly numbers were generally less than originally estimated by the pilot sites prior to the trial. The majority of data was contributed by two metropolitan hospitals. The median duration of each call was 20 minutes. Thirty percent of ward patients (n=164) had transferred from ED, Recovery or ICU during the 4 hours prior to call. Some of these patients may have benefitted from further stabilisation in ED or Recovery, or transfer directly to a higher level of care such as ICU. As expected, at least one ViCTOR purple parameter was breached for 83% of calls. Existing modifications were in place for a small percentage of patients (6%). Fifty- five significant events were recorded; the most common was initiation of high-flow oxygen therapy. Three children had a cardiac arrest, one of whom died. Thirteen percent of patients were escalated to a higher level of care (ICU, HDU or transfer to another hospital).

## Conclusions and recommendations

The Medical Emergency Response Metrics and related reports were found to be valuable for health services in reviewing processes and outcomes in relation to paediatric deterioration activity.. Collection of the data was feasible although a standardised paediatric electronic tool would facilitate ongoing data collection.

Although, benchmarking was not generally considered feasible due to the variability in sites and the low numbers of patients involved, key stakeholders highlighted the importance of being able to share information between services. Utilisation of the standardised Medical Emergency Response Metrics measures would facilitate such sharing of data.

Processes for sharing of data would need to be coordinated and sustainable. Most stakeholders were open to the idea of being able to share lessons arising from review of selected cases.

In light of the findings described in this report it is recommended that:

1. ViCTOR Medical Emergency Response Metrics are made freely available through the ViCTOR website with 'instructions for use'.
2. The Victorian Paediatric Clinical Network, through Safer Care Victoria, recommend that all Victorian Hospitals caring for paediatric (in) patients utilise these metrics in their local review of deteriorating patients.
3. The Victorian Paediatric Clinical Network, in collaboration with the Victorian Agency for Health Information (VAHI) work towards the development of an electronic tool for the collection of the ViCTOR Paediatric Medical Emergency Response Metrics, potentially through a designated Paediatric MET module in VHIMS.
4. The Victorian Paediatric Clinical Network explore opportunities to facilitate the sharing of the ViCTOR Medical Emergency Response Metrics between Victorian hospitals (e.g. an annual forum)



# 1. Introduction

## 1.1 Project purpose and objectives

This report describes a project to develop a set of paediatric clinical deterioration metrics to inform a sustainable state-wide monitoring framework for reporting paediatric clinical deterioration across Victorian hospitals.

The objectives of the project have been:

- To gain an understanding of current data collection and review processes in Victorian healthcare services
- To identify paediatric clinical deterioration metrics that will inform and support best practice and continuous improvement
- To develop a standardised tool for collecting paediatric clinical deterioration metrics in Victorian hospitals
- To pilot the data collection tool in metropolitan and regional Victorian hospitals that have implemented ViCTOR charts and evaluate it in terms of:
  - the utility of the tool and collection processes
  - the utility of the data for monitoring deterioration and assessing outcomes
  - the feasibility of ongoing data collection
- To use the collected data to gain an understanding of the population of hospitalised children who require a medical emergency response call, including the frequency, characteristics and outcomes for different hospitals
- To highlight opportunities that may be considered regarding a set of paediatric clinical deterioration metrics that could be routinely collected and analysed centrally within the Victorian healthcare system to support continuous improvement.

## 1.2 Background

Since 2013, the Victorian Paediatric Clinical Network (VPCN) has funded the Victorian Children's Tool for Observation and Response (ViCTOR) projects. The ultimate goal of the ViCTOR charts and associated escalation of care processes is to provide timely medical care to any deteriorating patient and so eliminate unexpected but preventable mortality, cardiac arrest and other life-threatening events.

Following sector-wide engagement and drawing on the most recent evidence of respiratory rate and heart rate percentiles for hospitalised children, a set of standardised observation charts was developed, incorporating age-related vital signs and other clinical observations for children across five age groups. Initially piloted in paediatric wards, a subsequent project evaluating the ViCTOR charts suitability for smaller rural health services resulted in the release of a set of 'ViCTOR Urgent Care' charts in late 2015, and in early 2017 two newborn charts were released for statewide use. To date, more than 70 Victorian health services, both public and private, are using the ViCTOR suite of charts (Project Health, 2016).





Supporting the use of the standardised charts, most Victorian hospitals have implemented medical emergency teams (MET) and/or Code Blue systems, to facilitate timely escalation of care.

To date, the evaluation of the charts has focused on their utility and their perceived value in identifying and managing the deteriorating patient. It has also measured the nature and extent of implementation, thus ensuring the charts are acceptable and accessible to users.

The need to establish objective measures of emergency response processes and patient outcomes has also been recognised in order to ensure the monitoring and escalation of care processes are functioning as intended, and to enable comparisons between organisations. A potential barrier in this regard is the lack of standardised measures and data collection. For example, the evaluation conducted in 2016 found local data collection to be variable and included measures such as:

- MET calls, MET deactivations
- Transfers to ICU /HDU
- Transfers to other services
- PIPER data reports
- Re-presentations following transfer
- Emergency Call Case reports

The requirements for data collection in relation to emergency response are outlined in the *National Consensus Statement: Essential elements for recognising and responding to acute physiological deterioration* (ACSQHC, 2017). Among the ten principles outlined in the guide is that “Organisations should regularly review the effectiveness of the recognition and response systems they have in place, including key performance and outcome indicators.”

In relation to this, the guide recommends that the following data should be collected for each call for emergency assistance:

- Patient demographics
- Date and time of call, response time and stand down time
- The reason for the call
- The treatment or intervention provided
- Any changes to calling criteria or new limitations of medical treatment documented as a result of the call
- Outcomes of the call, including disposition of the patient

The guide also recommends that information about reviews conducted by the attending medical officer or team should be included in the healthcare record, and that regular audits of triggers and outcomes should be conducted for patients who are subject of calls for emergency assistance. It goes on to recommend that information collected as part of ongoing evaluation and audit should be:

- fed back to ward staff and the attending medical officer or team regarding their own calls for emergency assistance



- fed back to the clinicians providing emergency assistance
- reviewed to identify lessons that can improve clinical and organisational systems
- used in education and training programs
- used to track outcomes and changes in performance over time

While the Commission provides guidance around local data collection, it does not provide standardisation of forms which would allow for benchmarking. This project was established to progress the development of standardised reporting of emergency response processes and paediatric clinical outcomes in Victorian hospitals, in order to support clinical best practice.

### 1.3 Governance and sector engagement

The VICTOR Governance Group met six weekly and membership was drawn from various paediatric specialists and stakeholders from across Victoria (see Table 1). The group was responsible for all decision making regarding project implementation including:

- reviewing and approving the project scope and objectives
- reviewing and approving an appropriate evaluation framework and KPIs for monitoring progress and assessing project success
- reviewing and approving reports and signing off on project milestones

**Table 1 ViCTOR Governance Group**

Representative	Representation
Peter McDougall, David Armstrong	VPCN Co-Clinical Leads
David Tran, Martin Wright	Metropolitan paediatric hospitals
Saba Subiramanian, Erin Brinsmead, Sam Peat	Regional paediatric hospitals (medical and nursing)
Michael Stewart	PIPER
Sean Tyrell	DHHS Manager Child Health Programs
Cath Harmer	DHHS Manager Policy and Programs Rural Health
Pam McGrath	Maternity and Newborn Clinical Network
	<b>In attendance</b>
Paulette Kelly, Sonia Denisenko	Manager VPCN
Annie Moulden	ViCTOR Medical Lead
Jen Sloane	Statewide Project Coordinator - ViCTOR
Sharon Kinney	ViCTOR Nursing Lead
Rebecca Cooney, Fiona Nielsen	VMIA representation
Anne Maree Baker	Project Officer, VPCN



A ViCTOR Metrics Expert Advisory Group (Table 2) comprising key Victorian paediatricians, paediatric intensivists, paediatric nurses, ICU liaison nurses and a quality and safety representative was formed to oversee the project, assist with determining the relevant metrics to be included in the trial data collection tool and provide advice on implementation.

**Table 2 ViCTOR Metrics Expert Advisory Group**

Representative	Representation/role
Tali Gadish	Consultant Intensivist, The Royal Children's Hospital
Felix Oberender	Director, Paediatric Intensive Care Unit, Monash Children's Hospital
Joel Ziffer	Paediatrician, Bendigo Health
Kathy McMahon	Director Paediatrics, Peninsula Health
Juliet Pellegrini	Quality, Safety and Innovation Manager, Children's Program, Monash Health
Kiraka (Patch) Nakazawa	PICU Outreach Clinical Nurse Consultant, Monash Children's Hospital
Amy Jones	RN, Ballarat Health Services
Rebecca Tracey	PICU Outreach Clinical Nurse Consultant, The Royal Children's Hospital

Face to face meetings and teleconferences were conducted between August and November.

Further sector engagement was facilitated through the involvement of, the ViCTOR Nursing Lead in the MET Subcommittee of the Victorian Critical Care Network.

For the purpose of this project, 'paediatric' is defined as any infant, child or adolescent in an inpatient ward, intensive care unit, emergency department or recovery unit aged 0-18 years.

## 1.4 Project activities and timeline

Key project activities and timelines are outlined in Table 3.

### Evaluation Approval

- Project Health Consultant
- ViCTOR Governance Group
- Ethics approval –the project was considered a quality improvement activity that was approved by the governance group, however, the ViCTOR project team is committed to publishing the findings. A low and negligible risk application has been submitted to the Human Research Ethics Committee at The University of Melbourne, where the project nurse lead is also an employee. The application seeks approval to utilise the findings for a publication. An outcome will be known late July.



**Table 3 Project Activities and Timeline**

ACTIVITY	2017						2018					
	JUL	AUG	SEPT	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN
<b>Sector and stakeholder engagement</b>												
Advisory Committee Meetings			▲▲	▲▲				▲				▲
<b>Establishment of evidence base</b>												
Literature review												
<b>Establishment of current practice</b>												
Health sector survey												
<b>Data collection form and report development</b>												
Development of form												
Revision of form in light of evaluation findings												
<b>Evaluation of form and data reporting</b>												
Pilot site recruitment and engagement												
Pilot site visits												
Development of evaluation framework												
Development of database												
Pilot implementation and collation of monthly data and monthly reports												
Interviews and focus groups with pilot sites												
<b>Other</b>												
Ethics submission												
Write up evaluation report												



## 2. Current evidence for paediatric emergency metrics

Development of the data collection tool was informed by a review of medical emergency response outcomes and processes reported in the paediatric literature and recommendations from the *National Consensus Statement: Essential elements for recognising and responding to acute physiological deterioration* (ACSQHC, 2017).

### Outcome Measures

The main outcome measures identified in the literature are paediatric cardiac arrests and respiratory arrests outside the intensive care environment, ICU admissions and hospital mortality (Brilli et al., 2007; Chan et al. 2010; Parshuram et al., 2018; Raymund et al., 2016; Sharek et al., 2007; Tibballs & Kinney, 2009).

Mortality and cardiac arrest is relatively rare in paediatric patients compared to adults, thus authors have proposed a range of other paediatric deterioration metrics, including extensive fluid resuscitation, reversal of opioid toxicity or initiation of inotropes (Bonafide et al. 2012; Brady et al. 2013; Kinney et al. 2008; Parshuram et al., 2018). These types of events were considered important because they were found to be related to a higher risk of mortality, or the severity of illness, indicating that avoidable clinical deterioration may have occurred.

### Process Measures

Several process measures have also been recommended to help ascertain that the system is functioning as intended. For example, the number of calls placed per month is a proxy measure for how well the escalation of care processes are adhered to. This is not only a function of the physiological trigger thresholds that are identified on the ViCTOR charts, but also the culture on a unit (Levin et al., 2015). Other process measures include calls stratified by time of day and day of week, family activated calls, the proportion of calls that occur following recent transfer from ED, ICU or Recovery, and the proportion of calls that are 'transferred up' to ICU or 'transferred out' to another hospital.



### 3. Current data collection and review processes in Victorian hospitals

To better understand how health services currently collect, manage and utilize medical emergency response data, a survey was distributed to all Victorian health services that treat paediatric patients (N=31). The survey is included in Appendix A and detailed data are included in Appendix B.

**Table 4 Survey of data collection for medical emergency response data**

	Services surveyed (n)	Number (%) responded
<b>Metropolitan</b>		
Public	14	6 (43)
Private	3	2 (67)
TOTAL:	17	8 (47)
<b>Regional</b>		
Public	14	7 (50)
Private	0	0
TOTAL	14	7 (50)
<b>TOTAL</b>	<b>31</b>	<b>15 (48)</b>

Fifteen health services (48%) responded to the survey (8 metropolitan and 7 regional). All 15 sites, which included two private hospitals, indicated that they routinely collect data after a medical emergency call.

With ten (67%) of the responding services (3 metropolitan, 7 regional) the same form was used for adult and paediatric patients, and did not include paediatric specific data. In seven services (4 metropolitan, 3 regional) the same form was used for both MET calls and Code Blues.

Most (73%) of responding services (6 metropolitan, 5 regional) collect the data on a paper form before entering it into a database or VHIMS/Riskman. The ICU liaison/outreach nurses or the attending emergency response team nurses are usually responsible for completing the forms (53%) or the bedside nurses (40%).

In ten services (67%) medical emergency call reports are reviewed at a Standard 9 Committee (e.g. Deteriorating Patient or Resuscitation Committee). At 4 (27%) services (3 metropolitan, 1 regional) emergency calls for paediatric patients are reviewed by the home team. Eleven (73%) of the responding services (6 metropolitan, 5 regional) indicated that there was a process for sharing lessons from these reviews, usually via the relevant committee structures. Cases where issues are identified may be referred to the Morbidity and Mortality Committee or a Patient Safety Committee.



Nine (60%) of the responding services (4 metropolitan, 5 regional) agreed that the development of a standardised form would be useful for their organisation. The remaining respondents were unsure. This uncertainty is highlighted in the following comment:

*'A standard minimum dataset would be helpful as this would assist with benchmarking with like organisations. A standard form may not be helpful as we have an established system for data collection, entry and reporting which currently works well!'*

All health services were willing to share a copy of their current data collection form which was considered in the development of the trial form.



## 4. Data collection tool and report development

The research evidence and existing medical emergency response forms were reviewed with the ViCTOR Metrics Expert Advisory Group, and consensus was reached regarding the elements to be included in the ViCTOR Medical Emergency Response trial form (see below).

These included:

- Hospital demographics
  - hospital
  - location of call (e.g. ward, ED)
- Patient demographics
  - admission diagnosis
  - age
  - gender
- Pre- call events
  - transfer from ED, ICU or Recovery within previous 4 hours
  - surgery in previous 48 hours
- Call details
  - date
  - time
  - duration
  - who initiated call
- Reason(s) call was made
  - changes in physiological parameters
  - staff or family worried
- ViCTOR status
  - breaching of ViCTOR purple parameters
  - whether any of these parameters had been modified prior to the call
- Significant events (based on the interventions provided during the call)
  - acute respiratory compromise
  - cardiac arrest
  - other events (e.g. extensive fluid resuscitation, reversal of opioid toxicity).
- Patient outcome post call
  - patient disposition within the hospital (e.g. remained on ward, transferred to ICU)
  - transferred out to another hospital
  - contact with PIPER
  - modifications of any Purple physiological parameters





# **Victorian Children's Tool for Observation and Response Medical Emergency Response TRIAL**

UR NUMBER

SURNAME

GIVEN NAME(S)

DATE OF BIRTH

AFFIX PATIENT LABEL HERE ↑

Hospital/Name: _____		Call location: <input type="checkbox"/> Ward <input type="checkbox"/> ED <input type="checkbox"/> Other: _____	
UR number: _____	Date of birth: ____/____/____	Gender: <input type="checkbox"/> Male <input type="checkbox"/> Female	
Admission diagnosis: _____		Postoperative <48 hours: _____	
Presumed reason/diagnosis for emergency call: _____			
Type of call:	<input type="checkbox"/> MET call	<input type="checkbox"/> Upgraded to code blue	<input type="checkbox"/> Code Blue <input type="checkbox"/> Other: _____
Date of call: ____/____/____	Time of call: _____ a.m./p.m.	Call finished: _____ a.m./p.m.	
Call made by:	<input type="checkbox"/> Doctor	<input type="checkbox"/> Nurse	<input type="checkbox"/> Family <input type="checkbox"/> Other: _____
In the last 4 hours prior to call was the patient transferred from:	<input type="checkbox"/> ED	<input type="checkbox"/> ICU	<input type="checkbox"/> Recovery <input type="checkbox"/> N/A
<b>Reason(s) Call was Made</b> (Tick all applicable)			
<input type="checkbox"/> Staff worried	<input type="checkbox"/> Family worried	<input type="checkbox"/> Airway compromise	<input type="checkbox"/> Low SpO <sub>2</sub> <input type="checkbox"/> Reduced consciousness
<input type="checkbox"/> High RR	<input type="checkbox"/> Low RR	<input type="checkbox"/> Respiratory distress	<input type="checkbox"/> Respiratory arrest <input type="checkbox"/> Seizure
<input type="checkbox"/> High HR	<input type="checkbox"/> Low HR	<input type="checkbox"/> Hypotension	<input type="checkbox"/> Cardiac arrest <input type="checkbox"/> Other: _____
<b>VICTOR Purple Parameter Breached?</b> (Tick all applicable)		<b>Existing Modification(s) at Time of Call</b>	
<input type="checkbox"/> High RR	<input type="checkbox"/> High HR	<input type="checkbox"/> Hypotension	<input type="checkbox"/> High RR <input type="checkbox"/> High HR
<input type="checkbox"/> Low RR	<input type="checkbox"/> Low HR	<input type="checkbox"/> Level of consciousness	<input type="checkbox"/> Low RR <input type="checkbox"/> Low HR
<input type="checkbox"/> Respiratory distress	<input type="checkbox"/> Low SpO <sub>2</sub>	<input type="checkbox"/> Level of sedation:	<input type="checkbox"/> Low SpO <sub>2</sub> <input type="checkbox"/> Hypotension
<b>Significant Event</b> (During or immediately prior to the call)			
<b>Acute Respiratory Compromise</b>			
<input type="checkbox"/> Bag mask ventilation	<input type="checkbox"/> Intubation and ventilation	<input type="checkbox"/> Initiated high flow O <sub>2</sub>	<input type="checkbox"/> Initiated/Escalated CPAP or BiPAP
<b>Cardiac Arrest</b>			
<input type="checkbox"/> Chest compressions	<input type="checkbox"/> Defibrillation	<input type="checkbox"/> Initial Rhythm: _____	
<b>Other</b>			
<input type="checkbox"/> Reversal of opioid toxicity (Naloxone)	<input type="checkbox"/> IM or IV adrenaline	<input type="checkbox"/> Initiated/Escalated inotropes	
<input type="checkbox"/> Reversal of sedation (Flumazenil)	<input type="checkbox"/> Extensive Fluid Resuscitation (≥40mL/kg)		
<b>Patient Outcome Post Call</b> (up to four hours)			
<input type="checkbox"/> Resolved without intervention	<input type="checkbox"/> Remained on ward with advice/intervention	<input type="checkbox"/> Died	
<input type="checkbox"/> HDU	<input type="checkbox"/> ICU	<input type="checkbox"/> ED	<input type="checkbox"/> Theatre <input type="checkbox"/> Other: _____
Transferred to:	<input type="checkbox"/> Monash Children's	<input type="checkbox"/> RCH	<input type="checkbox"/> Other: _____
<input type="checkbox"/> Contacted PIPER:	<input type="checkbox"/> Parameters modified, list: 1 _____ 2 _____ 3 _____		

**DO NOT FILE THIS FORM IN MEDICAL RECORDS**

Please return this form to your local medical emergency call co-ordinator/contact person



11/2019 November 2017



It was agreed that the focus of the data collection tool should be on creating a minimum data set that would allow for potential benchmarking across paediatric settings and inform a local, more detailed, review.

When existing medical emergency forms were reviewed from other Victorian health services, many of the above elements were accounted for in their local forms. Additional elements for many sites included: location of patient in the four hour period prior to the call, postoperative status, breaching of ViCTOR purple parameters, existing modification of parameters, some specific significant events, consults with PIPER and modification of parameters made during the call.

The timeframe of four hours within discharge from ED, ICU or Recovery was an arbitrary measure, which aimed to identify unwell patients that may have benefited from further stabilisation in the respective setting or admission to an ICU. Some hospitals had identified a time frame of within 24 hours of admission to hospital. In a paediatric setting this was considered a lengthy period when, the average length of stay was often only 2-3 days.

An information sheet was made available to each of the pilot sites to provide additional explanation of the data elements (see Appendix C).

A proposed reporting format was developed based on these elements and the ViCTOR Medical Emergency Response trial form and with stakeholder input. The reports were designed to enable easy review of emergency call data, highlight patterns and trends, and provide insights into the nature of paediatric deterioration.



## 5. Pilot and evaluation of the data collection tool and report

### 5.1 Pilot site recruitment and support

In August 2017, a statewide expression of interest to participate in the pilot project generated 12 applications from a variety of hospitals across the state. All 12 hospitals were chosen to participate in the pilot and evaluation of the ViCTOR Medical Emergency Response trial form. Table 5 shows the estimated number of medical emergency calls per month as determined by the participating sites.

Some of the smaller pilot sites indicated that the reason for the low number of medical emergency calls was because of the ready access to paediatricians who were immediately available on the ward, and therefore the emergency response team was not needed. In contrast, one site with a greater than expected number of calls, explained that many of the MET calls were made to paediatric patients in ED, at triage, before treatment was instigated. This practice was being reviewed by the local site.

**Table 5 Pilot sites and estimated number of medical emergency calls**

Hospital	Estimated medical emergency calls per month (n)
<b>Metropolitan</b>	
Austin Health	2
Cabrini Health (Private)	2-3
Epworth Health Care (Richmond) (Private)	0-2
Monash Children's	30
Northern Health	29-75
Peninsula Health	1
Royal Children's Hospital	50 - 60
<b>Regional</b>	
Ballarat Health Services	2-3
Barwon Health	20
Bendigo Health	3
Latrobe Regional Hospital	0-1
Northeast Health	0 -2



Implementation of the trial form took place over five months (December to April) with implementation being supported through:

- Teleconferences with pilot sites
- Site visits by members of the ViCTOR team to identify key stakeholders and discuss any implementation issues
- Feedback to the project team via email and phone
- Sharing of monthly summary data over a five month period

These activities provided an informal formative role in gaining an understanding of how the trial forms were initially used and accepted.

## **5.2 Pilot implementation**

At the time of any medical emergency call, the attending member of the medical emergency response team (usually an attending nurse or ICU liaison nurse) collected data using their hospital's current forms. These same personnel also completed the one-page ViCTOR Medical Emergency Response trial form. At the end of each month (December 2017 to April 2018), the pilot site champions scanned the trial forms to the ViCTOR project team who entered the data into an Excel spreadsheet.

The exception to this process was for the RCH pilot site which had recently transitioned the majority of the medical emergency response data elements into a report extracted from the electronic medical record. The hospital had hoped a modification to this report could be made to include the additional elements from the ViCTOR Medical Emergency Response trial form. The data was then to be extracted monthly by the pilot site champion and sent directly to the project team. Unfortunately, this did not eventuate throughout the pilot period and no data was collected from this hospital.

A perforated edge at the top of the trial form allowed for pilot sites to remove patient identification details which were not sent to the ViCTOR project team. However, the UR number of the patient was included on the main part of the form to enable analysis of those patients who had multiple medical emergency calls.

All data collected from the pilot hospitals was collated and developed into two reports, which was shared with the hospitals on a monthly basis. Descriptive data analyses were undertaken, including frequency counts and percentages for most variables and calculation of the mean duration of the emergency response call. Relevant data was presented in histograms, graphs and tables. The first report included summary data from the combined sites (see Appendix D), and then a second report was prepared for each pilot site that enabled comparison of their local data with the aggregate findings from the 11 pilot sites.

Between December 2017 to April 2018, 286 calls occurred across 10 pilot sites ranging from 1 to 161 calls at each site (Table 6).



**Table 6 Responses per pilot site**

Hospital	DEC 17 (N=54)	JAN 18 (N=48)	FEB 18 (N=54)	MAR 18 (N=66)	APR 18 (N=64)	Total (N=286)	% of total
<b>Metropolitan</b>							
1	1	-	2	-	1	4	1.4
2	-	-	-	-	-	-	-
3	-	-	1	1	-	2	0.7
4	16	15	14	17	22	84	29.4
5	30	27	28	39	37	161	56.3
6	-	1	-	1	-	2	0.7
<b>Regional</b>							
7	-	1	3	1	1	6	2.1
8	6	2	3	4	1	16	5.6
9	1	1	2	3	1	8	2.8
10	-	1	1	-	-	2	0.7
11	-	-	-	-	1	1	0.4

### 5.3 Evaluation objectives and methods

The specific objectives of the pilot evaluation were:

- To determine the utility of the proposed data fields for monitoring deterioration and assessing outcomes
- To determine the utility of the data collection form in terms of layout and data options etc
- To identify the data fields that would be suitable for benchmarking
- To determine the utility of benchmarking reports produced from the data
- To determine the feasibility of ongoing data collection
- To inform refinement of the data collection form and processes
- To inform recommendations regarding a sustainable statewide monitoring framework for reporting paediatric clinical deterioration across Victorian hospitals.



The multi-method evaluation involved informal (formative) and formal (summative) approaches. Formative evaluation commenced during the trial form development stage (as described above) and continued through the implementation stage.

The two data collection methods used for the formal evaluation were:

- Audit of adequacy of completion of medical emergency response forms
- Focus groups and/or interviews with key stakeholders

**Table 7 Summary of evaluation objectives and methods**

Objective	Method and analysis
To determine the utility of the data fields for monitoring deterioration and assessing outcomes	Audit, Interviews/Focus Groups
To determine the utility of the data collection tool in terms of layout and data options etc	Audit, Interviews/Focus Groups
To identify the data fields that would be suitable for benchmarking	Interviews/Focus Groups, Expert Advisory Group
To determine the utility of benchmarking reports produced from the data	Interviews/Focus Groups
To determine the feasibility of ongoing data collection	Interviews/Focus Groups
To inform refinement of the data collection tool and processes	Audit/Interviews/Focus Groups
To inform recommendations regarding a sustainable statewide monitoring framework for reporting paediatric clinical deterioration across Victorian hospitals	Audits, Interviews/Focus Groups, Expert Advisory Group, ViCTOR Governance Group

Audits were conducted of the 286 completed trial data collection forms to determine usability and feasibility of data collection. All forms were audited as they were received and processed by the project team. Analysis identified completion of data fields and characterised any errors in data completion.

Six face-to-face focus groups and four telephone interviews were conducted, involving 22 key personnel from nine pilot sites. Participants included pediatricians (n=8) intensivists (n=2), nurse managers (n=6), ICU liaison staff (n=4), quality manager (n=1) and nurse educator (n=1).

The focus groups and interviews explored the usability of the data, feasibility of maintaining ongoing data collection and gained a better understanding of how the data was, or could be, used in their health service.

The data from the summary reports was referred to during the focus groups/interviews and stakeholder consultation. For those sites participating in telephone interviews the questions (see below) were sent in advance to enable participants to seek feedback from additional staff who could not join the telephone interview.



Participants in the focus groups, or interviews, were asked to consider the following:

- How is the medical emergency response data being used in your health service?
- What are the key elements from the data that would be suitable for benchmarking?
- What are your expectations about how benchmarking of the data might be managed going forward, including the role of the Victorian Paediatric Clinical Network?
- What are the most useful elements of the ViCTOR Medical Emergency Response trial form? Are there elements on the trial form that are unnecessary? Are there additional elements that should be included?
- Could the elements from the ViCTOR Medical Emergency Response trial form be easily incorporated into your local forms or databases? If not, why not?
- Are there any barriers to collecting the data?
- What other comments would they like to make?

Focus groups and interviews were approximately 45 to 60 minutes duration. One member of the project team facilitated the discussion, and the second project team member took notes throughout the discussion. Telephone interviews were facilitated by just one member of the project team, who also took the notes.

The data was analysed by the project team and clustering of similar topics were grouped into categories.

## **5.4 Evaluation findings**

### **5.4.1 Adequacy of completion of medical emergency response forms**

The database was evaluated for completion of documentation and overall there were few missing data. Missing data occurred in 8 of the 15 data fields as shown in Table 8. The most frequent field that was not recorded was the time that the call finished (7.3%) which impacted the determination of duration of each call. This may reflect the difficulty in deciding when the call finishes, as sometimes members of the team leave at different times, and ongoing care may be provided by a remaining staff member, for example, an ICU Outreach Nurse. Gender was missing on 3.5% of the forms. Whilst this would normally be determined from the patient identification label that was located at the top of the form, this part of the form was removed by pilot sites prior to submitting data, to ensure that de-identification of data was maintained.



**Table 8 Data fields with missing data (N=286)**

Data Field	Not completed, n (%)
Date of call	1 (0.4)
Call finished	21 (7.3)
Call made by	3 (1.1)
Gender	10 (3.5)
Admission diagnosis	3 (1.1)
Presumed reason/diagnosis for emergency call	2 (0.7)
Patient outcome post call	2 (0.7)

### 5.4.2 Utility of the data fields for monitoring deterioration

The majority of participants thought that all data fields were necessary for reporting patient deterioration. The most useful information identified was:

- The number of calls
- Location of calls
- Admission diagnoses
- Purple parameter breaches
- Significant Events
- Patient Outcomes

An unnecessary element that was suggested by two participants, from different pilot sites, was whether it was necessary to report the person who made the call (i.e. nurse or doctor) however, reporting family activated calls was considered essential.

During the monthly collation of the data, it was noted that the Presumed Reason/Diagnosis for call was frequently reported simply as a change in vital sign (e.g. tachycardia or tachypnoea) which essentially was a repeat of the Reason(s) Call was Made. This field was intended to help identify if the potential diagnosis leading to the call was different from the admission diagnosis (for example, a child who was admitted for a surgical procedure but sepsis was the reason for the medical emergency call). It was acknowledged that determining this latter diagnosis was not always feasible at the end of the call, and often relied on additional diagnostic information. Some participants proposed that the Presumed Reason/Diagnosis for call may not be necessary. Another participant suggested moving it to the bottom of the form, so that it reflected a decision made at the end of the call, based on assessment and interventions that were initiated.

Although, Gender was an identified field on the form, it was not summarised in the monthly reports prepared for the pilot sites. Most participants thought that it was unnecessary information.

Three of the pilot sites (all metropolitan) had tabled the summary reports at their Deteriorating Patient Committee (or equivalent committee). Some reported they had not fed back to such a committee because of the few medical emergency calls that had been made during the pilot period. Nevertheless,





they thought that it was useful to keep it on the agenda, even when there were few calls. Participants from four other pilot sites commented that they planned to review the data at their local Paediatric Clinical Advisory Group or Mortality and Morbidity meeting. Another site reported that it was useful information to share with their ICU staff, and that the data contributed to overall monitoring of the systems' processes and outcomes.

Individual significant events, as identified on the form, had also been reviewed more closely by at least three of the pilot sites. An ICU Liaison Nurse, from a regional site, reported that the data was particularly informative as they were planning to increase their ICU capability for paediatrics. Reviewing the types of significant events that occurred also helped to guide the ongoing education necessary for staff.

One participant, at a regional site, did not think the monthly reports added much value, as she did not think it would change what they were doing. It was also recognised that Significant Events were a very rare event at this pilot site. However, her colleagues from the same site thought that the data was incredibly useful.

Two key stakeholders from two of the pilot sites were unaware of the monthly reports until prompted by the ViCTOR team when organising the interviews. This was mainly due to the report not being circulated widely by the pilot site key contact.

### 5.4.3 Refinement of the medical emergency response form

Following feedback from the pilot sites and discussion with the Expert Advisory Group the following amendments were made to the medical emergency response form (see Table 9).

**Table 9 Summary of amendments made to the medical emergency response form**

Change made	Rationale
Addition of a Yes/No box to ViCTOR Purple Parameter Breached?	The need to do this was identified early in the pilot. Data collectors thought that when no elements in this section were ticked a 'No' box would make this clearer. Many of the data collectors added such a box to the form during the pilot.
Not Applicable (N/A) option was added to the Existing Modification(s) at Time of Call	Improve clarity
Addition of a Yes/ No box to the Significant Event section	Improve clarity
Presumed Reason for Call was moved towards the end of the form	Better reflected the logical decision making processes that occur throughout the medical emergency response
Changes were made to the Significant Event fluid resuscitation section to accommodate: Extensive Fluid Resuscitation ( $\geq 40$ mL/kg) OR Smaller fluid bolus	Initially, it was identified as Extensive Fluid Resuscitation ( $\geq 40$ mL/kg). However, participants from three pilot sites suggested it was important to know if any bolus of fluid (eg 10 mL/kg) was administered. One expert advisory group member considered this an unnecessary distinction arguing that it was better to just focus on the greater volume which reflected a more serious



Change made	Rationale
	illness. The final decision was made to allow for both options.
A new question was added to the bottom of the form: 'Does this case require a more detailed review?'	This question was to capture any concerns that may be known at the time of the call. It provided another opportunity to identify potential adverse events or other problems with processes of care that warranted further investigation.
A universal scanning code was added to the form.	Health service requirement

Other suggestions that were made by a few participants were considered by the Expert Advisory Group but not added to the revised form. These included:

- Clinical Review within the previous 4 hours
- Criteria breached in previous 24 hours, but not escalated
- Delayed escalation or failure of urgent review processes
- Expansion of the form to include all clinical reviews
- Missing low level interventions (eg administration of various medications)
- Not For Resuscitation status

The rationale for not including the first four items, related to either the burden of work required by the medical emergency response team, at the time of call, and/or the difficulty in determining whether there had been a delay or failure of urgent review processes at the time of completing the form. It was considered that these aspects should be taken into account at subsequent case reviews (i.e. when reviewing children who had a Significant Event, or those cases that were identified as requiring a more detailed review on the form). It was also acknowledged that children breached the clinical review criteria (i.e. the orange zone of the VICTOR charts) more frequently, and a clinical review involved at a minimum, consultation with the nurse in charge or a medical review. Determining these elements accurately may not be easily established during the medical emergency call. Nevertheless, it was agreed that regular audits of these aspects of escalation of care should be conducted routinely by health services as recommended by the National Safety and Quality Health Service Standards (2017).

Inclusion of low level interventions, such as administration of various medications or initiation of low flow oxygen therapy were considered not consistent with the goal of establishing a minimum data set that focused on interventions that indicated more serious illness.

It was appreciated that Not For Resuscitation status was an important element for adult data collection, but not as relevant in the paediatric setting. Again, it was agreed that resuscitation status should be considered during any review of cases or significant events.



#### **5.4.4 Feasibility of ongoing data collection**

Participants were asked if there were any barriers to collecting the data. Overwhelmingly, they considered completion of the form as being a simple, easy task. It usually only took a few minutes to be completed by the bedside nurse or a member of the medical emergency response team. It was also easy to fill in the form retrospectively, if the local hospital form had been completed, but not the trial form.

Concerns were raised regarding duplication of their local hospital medical emergency forms and how they would integrate the additional data elements into their own data bases. All pilot sites, except one, entered data from paediatric medical emergency calls into a locally designed data base or VHIMS module, which was usually managed by ICU staff or ED staff. Most participants thought that they already collected the majority of data fields and that they could relatively easily integrate the additional elements. However, for most sites this would include supplementing their data bases with, location of patient in the four hour period prior to the call, postoperative status, breaching of ViCTOR purple parameters, existing modification of parameters, some specific significant events, transfers to another hospital, consults with PIPER, and modification of parameters made during the call. Several pilot sites suggested that a standardised paediatric module in VHIMS would be appealing.

#### **5.4.5 Utility of benchmarking reports and measures suitable for benchmarking**

Participants identified that it was difficult to determine measures suitable for benchmarking, in part, because of the variability of the number of calls across sites, and due to the fact that different medical emergency response systems existed within each of the health services. Instead, the measures were considered most useful for individual organisations to enable review of trends over time.

It was suggested that 'like hospitals' with similar casemix and characteristics could be grouped together and that quality measures could be shared amongst similar health services, as determined by the health service. It was also recognised that sharing of data was challenging for the private sector, when other hospitals were thought of as their competitors. One participant highlighted that the data should not be used to rank or penalise individual health services.

Two key process measures were proposed for health services to monitor:

1. The rate of medical emergency response calls as determined by the number of calls per 1000 patient separations or admissions.
2. The rate of transfers to a higher level of care (ED, HDU, ICU or another hospital) per 1000 patient separations or admissions.

The optimal rate of medical emergency response calls in the paediatric setting is unknown. It is possible that a higher emergency call rate is desirable, as it may indicate that patients who are deteriorating are being identified and reviewed promptly. Alternatively, a high calling rate may represent a failure of other processes of care to prevent or detect deterioration within the health service. Nevertheless, trending this information could be useful for individual organisations.



Other measures that were of interest to the participants were:

- Reason for the call
- Breaching of ViCTOR parameters
- Existing modifications and by how much
- Significant events
- Age group
- Time of call



## 6. Characteristics and outcomes of hospitalised children who had a medical emergency call

Each month, data was collated by the ViCTOR team and a summary report, along with a report of the individual pilot site's local monthly data was sent to the key contact. The final summary report is shown in Appendix D.

In total, there were 286 medical emergency calls across 10 pilot sites for the duration of the trial. One pilot site had no medical emergency calls and data was not available from one of the initially selected pilot sites. Of the 286 calls, 232 were unique patients, indicating multiple calls were made for some patients. The report was based on the number of calls, rather than unique patients.

Almost 60% of calls were made in the ward, as shown in Table 10. The relatively high percentage of calls in ED reflects the local procedures from one pilot site, which also had the greatest number of emergency response calls. The majority of calls were made by nurses (93%) and 2 calls were initiated by family members. The median duration of each call was 20 minutes (ranging from 4 minutes to 4 hours and 15 minutes).

**Table 10** Location of calls

Location	(N=286)	%
Ward	164	57.3
ED	112	39.2
Other	10	3.5

Table 11 reveals that 30% of the ward patients (N=164) had transferred from ED, ICU or Recovery during the four hours prior to the call highlighting that this subgroup of patients were at higher risk and warranted close observation.

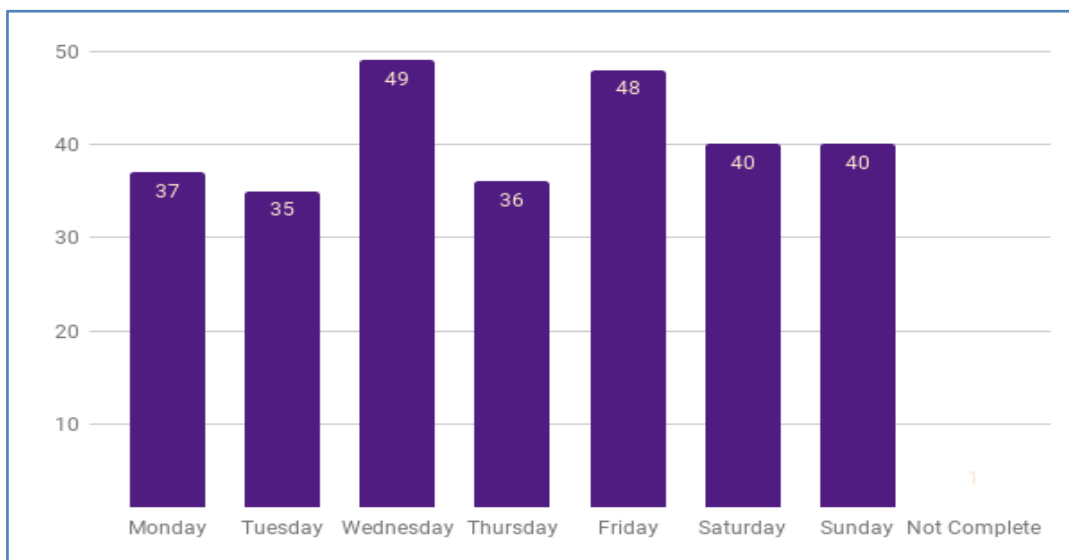


**Table 11** Location of ward patients during the 4 hour period prior to call

Transferred From	Ward patients (N=164)	%
ED	33	20.1
ICU	1	0.6
Recovery	15	9.1

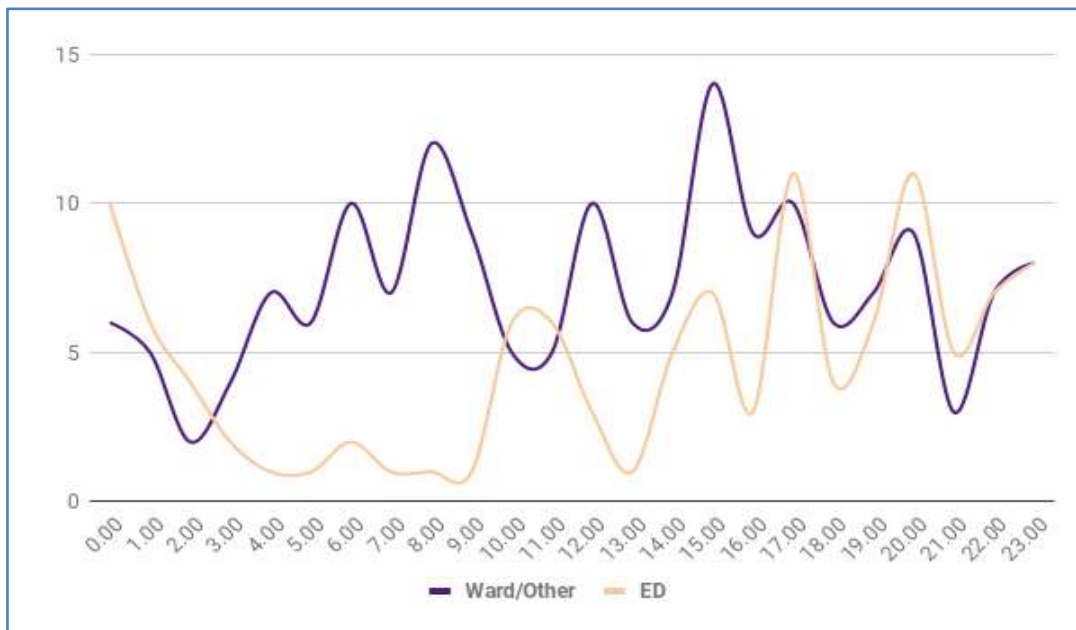
As shown in Figure 1, calls were made more frequently on a Wednesday and Friday, although they were relatively evenly spread across the days of the week, including the weekend. Figure 2 differentiates the time of call according to whether the call was initiated in the ward/other department or the ED. The peak time of call was between 15:00 - 15:59 for ward patients, and between 17:00 - 17:59 and 20:00 - 20:59 for ED patients.

**Figure 1** Day of call





**Figure 2 Time of call**



Admission diagnoses were classified according to the Australian and New Zealand Paediatric Intensive Care Registry (ANZPICR) codes (2017) and are presented in Table 12. Within the miscellaneous category, 11 children had presumed sepsis, 1 child febrile neutropenia, and 18 children had an unknown febrile illness. Twenty two (7.6%) children had surgery within the previous 48 hours of the call. A greater proportion of children were aged between 1-4 years (31%) followed by 12-18 years (23%).

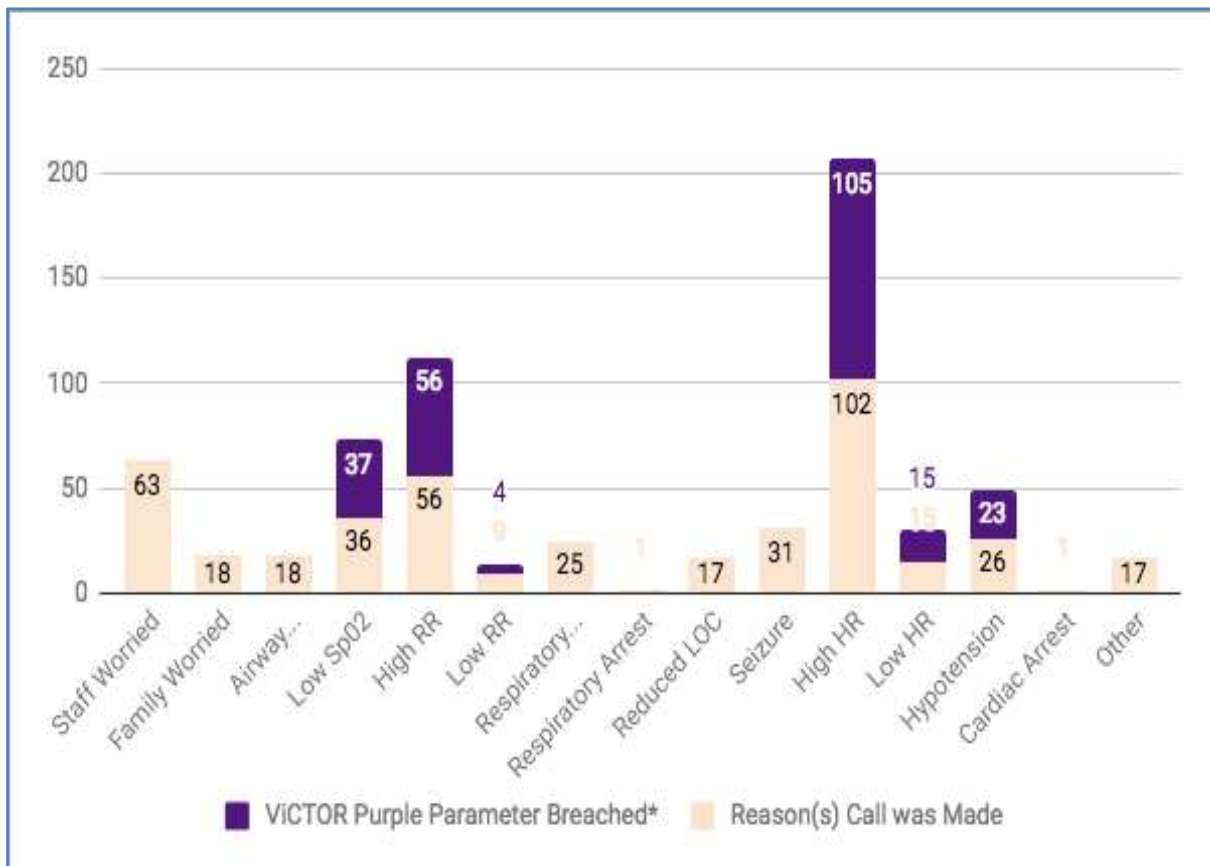
**Table 12 Admission Diagnosis**

Admission Diagnosis:	(N=286)	%
Respiratory	91	31.8
Neurological	46	16.1
Gastrointestinal/Renal	33	11.5
Miscellaneous	75	26.2
Postoperative (Non-Cardiac)	27	9.4
Cardiovascular (Inc. Post-Op)	6	2.1
Injury	5	1.8
Incomplete By Site	3	1.1



Figure 3 summarises the specific reasons for call (multiple reasons could exist) and whether a ViCTOR purple parameter was breached. Of the 286 calls made, a ViCTOR Purple Parameter was breached for 83% on at least one occasion. Nineteen modifications were made to the purple parameters prior to the time of call and were for: Low SpO<sub>2</sub> (n=2), High HR (n=11), High RR (n=7) and Low RR (n=1) and low BP (n=1).

**Figure 3 Reason for call**



The number of significant events is shown in Table 13. Some children had multiple types of significant events, usually requiring additional interventions such as intubation, adrenaline, fluid resuscitation or inotropes in association with the cardiac arrest. The most common significant event was the initiation of high flow oxygen therapy. Three children had a cardiac arrest:

1. An infant presenting to ED with nausea and vomiting and subsequently died
2. An infant in theatre who developed laryngospasm
3. A toddler on the ward post-surgery (T & A) who was later transferred to RCH





**Table 13 Significant events**

Significant events	(N=286)	%
Bag Mask Ventilation	9	16.4
Intubation and Ventilation	6	10.9
Initiated High Flow O2	23	41.8
Initiated/Escalated CPAP or BiPAP	6	10.9
Cardiac Arrest	3	5.5
Reversal of Opioid Toxicity (Naloxone)	2	3.6
IM or IV Adrenalin	2	3.6
Initiated/Escalated Inotropes	2	3.6
Reversal of Sedation (Flumazenil)	-	-
Extensive Fluid Resuscitation (≥40 mL/kg)	2	3.6
<b>Total</b>	<b>55</b>	<b>100</b>

Table 14 shows that 13% of the patients were escalated to a higher level of care (e.g ICU, HDU, ED or transferred to another hospital). Although only 9 children were transferred to another hospital, PIPER was consulted on 17 occasions. Two children that were initially transferred to an ICU were later transferred out to another hospital.

**Table 14 Patient Outcome Post Call According To Call Location**

Patient Outcome Post Call:	Ward	ED	Other	Total (N=286)	%
Resolved without intervention	4	3	1	8	2.80
Remained on ward with advice/intervention	135	98	6	239	83.57
HDU	-	4	-	4	1.40
ICU	15	1	-	16	5.59
ED	4	1	1	6	2.10



Other ( <i>Transferred to Another Hospital</i> )	3	4	2	9	3.15
Theatre	1	-	-	1	0.35
Unknown	2	-	-	2	0.70
Died	-	1	-	1	0.35
Total	164	112	10	286	100



## 7 Conclusions and recommendations

The Medical Emergency Response Metrics and reports arising from the data collection, was considered a valuable way to provide health services with the opportunity to reflect on paediatric deterioration activity.

It enabled health services to monitor their data trends on patient and medical emergency response outcomes. Nevertheless, during the pilot, the majority of data (86%) was contributed by only two metropolitan hospitals. This variation in numbers across the paediatric settings provides challenges when making comparisons or establishing benchmarking.

Although, benchmarking was not generally considered feasible, key stakeholders highlighted the importance of being able to share information across sites. Utilisation of the standardised Medical Emergency Response Metrics measures would facilitate such sharing of data. Some hospitals already generated monthly reports of medical emergency responses. Others suggested that quarterly, six monthly or even yearly reports were more appropriate, depending on the size of the health service and the purpose of the report.

Processes for sharing of data would need to be coordinated and sustainable. The Victorian Agency for Health Information ( VAHI ) was suggested for this role, with the VPCN giving context and oversight. It was thought a yearly meeting could be organized, and ideally incorporated into an existing forum (e.g. as organized by the Victorian Paediatric Clinical Network or the Paediatric Nurse Manager Group or the relatively recently established PICUgroup).

Most stakeholders were open to the idea of being able to share lessons arising from review of selected cases.

The occurrence of a significant event or the transfer of a child to another hospital would be the trigger for a more detailed case review at a local organisation. Having a better understanding of how the medical emergency response system was structured in different organisations was also considered important to stakeholders. They identified they would also like to know more about the clinicians that formed the response teams and the type of training that was conducted for their team members.

As previously mentioned in section 5.4.4 a standardised electronic tool would facilitate data collection (e.g. paediatric module in VHIMS).



In light of the findings described in this report it is recommended that:

1. ViCTOR Medical Emergency Response Metrics be made freely available through the ViCTOR website with 'instructions for use'.
2. The Victorian Paediatric Clinical Network, through Safer Care Victoria, recommend that all Victorian Hospitals caring for paediatric (in) patients utilise these metrics in their local review of deteriorating patients.
3. The Victorian Paediatric Clinical Network, in collaboration with the Victorian Agency for Health Information (VAHI) work towards the development of an electronic tool for the collection of the ViCTOR Paediatric Medical Emergency Response Metrics, potentially through a designated Paediatric MET module in VHIMS.
4. The Victorian Paediatric Clinical Network explore opportunities to facilitate the sharing of the ViCTOR Medical Emergency Response Metrics between Victorian hospitals (eg an annual forum).



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## Appendix A - Survey of Victorian Healthcare services

1. Name of your organisation
2. Is information collected after an Emergency Call (e.g. MET or Code) on your paediatric patients?
3. Is this information the same for paediatric MET and Paediatric Code Blues (i.e. cardiac arrest)?  
☐ Yes ☐ No, different forms used ☐ N/A, we don't have a separate Code Blue Response
4. Is the information paediatric specific?  
☐ Yes, paediatric specific ☐ No, adult form only (e.g. hospital –wide form) ☐ Other (Explain)
5. How is the information initially collected?  
☐ Paper based ☐ Electronic form (e.g. direct entry via iPad) ☐ VHIMS/Riskman ☐ Patient notes  
☐ Other (Explain)
6. On the majority of occasions, during a paediatric Emergency Call, who usually fills in the data collection tool (at the bedside)?  
☐ ICU liaison/outreach nurse ☐ Attending MET/Code Blue nurse ☐ Bedside nurse ☐ Nurse in charge ☐ Attending MET/Code Blue medical staff ☐ Medical staff from the patient's treating team ☐ Other (Explain)
7. Who compiles the Emergency Call reports in your health service?  
☐ ICU staff ☐ Quality & Safety ☐ Don't know ☐ Other (Explain)
8. Who reviews Emergency Calls on your paediatric patients in your health service?  
☐ ICU only ☐ Home team ☐ Ward/Units ☐ Standard 9 Committee (e.g. deteriorating patient committee) ☐ Mortality & Morbidity Committee ☐ Other Quality Meeting (Board/Executive) ☐ Quality Manager only ☐ Other (Explain)
9. Is there a process for sharing 'lessons learned' from these reviews?
10. Would the development of a standardised paediatric ViCTOR Emergency Call form be useful for your health service?
11. If required would you be prepared to share any forms that you currently use with us?
12. Finally, please feel free to provide additional comments which assist in clarifying for us your current systems and processes.



## Appendix B - Survey results

Survey of Victorian Healthcare Services (n=15)

Question 1: Is information collected after an Emergency Call on your paediatric patients?

	Number of responses n (%)		
	Metro	Regional	Total
Yes	8	7	15 (100)
No	0	0	0

Question 2: Is this information the same for paediatric MET and Paediatric Code Blues?

1.	Number of responses n (%)		
	Metro	Regional	Total
Yes	4	3	7 (46)
No, different forms used	3	4	7 (46)
N/A, we don't have a separate Code Blue Response	1	0	1 (7)
<i>We don't have a separate Code Blue response</i>			

Question 3: Is this information paediatric specific?

	Number of responses n (%)		
	Metro	Regional	Total
Yes, paediatric specific	3	0	3 (20)
No, adult form only (e.g. hospital-wide form)	3	7	10 (67)
Other	2	0	2 (13)
<p>- Information gathered for neonates, paediatrics and adults on hospital wide form then entered into database</p> <p>- Paediatric specific Emergency response paper form (currently trial) is used during a emergency call and the VHIMS is entered post the event.</p>			





**Question 4: How is the information initially collected?**

	Number of responses n (%)		
	Metro	Regional	Total
Paper based form	5	5	10 (67)
VHIMS/Riskman	1	1	2 (13)
Patient Notes	0	1	1 (7)
Other	2	0	2 (13)
- And on the EMR/patient notes - Paper based then put in a database			

**Question 5: On the majority of occasions, during a paediatric Emergency Call, who usually fills in the data collection tool (at the bedside)?**

	Number of responses n (%)		
	Metro	Regional	Total
ICU liaison / outreach nurse	3	0	3 (20)
Attending MET / Code Blue nurse	2	3	5 (33)
Bedside nurse	3	3	6 (40)
Nurse in charge	0	1	1 (7)
Attending MET / Code Blue medical staff	0	0	0
Medical staff from the patient's treatment team	0	0	0
Other (explain):	2	0	2 (13)
<i>Designated Emergency Nurse (who is part of the response team)</i> - ICU outreach fills VHIMS during service hours. ICU RN will fill VHIMS after PICU outreach hours. A scribe nurse will a paper-based form during the event.			



**Question 6: Who compiles the Emergency Call reports in your health service?**

	Number of responses n (%)		
	Metro	Regional	Total
ICU Staff	0	4	4 (27)
Quality & safety	3	0	3 (20)
Other (explain):	5	3	8 (53)
<ul style="list-style-type: none"> <li>- Outreach staff member</li> <li>- Emergency ANUM has designated portfolio, puts the data into Riskman module- reviewed by Quality Manager</li> <li>- Clinical Lead Clinical Deterioration &amp; Resuscitation</li> <li>- ED staff member</li> <li>- PICU outreach and Business intelligence team</li> <li>- Resuscitation coordinator</li> <li>- ICU Liaison enters data, quality &amp; safety manage VIHMS data base</li> <li>- Staff member responsible for Standard 9</li> </ul>			

**Question 7: Who reviews Emergency Calls on your paediatric patients in your health service?**

2.	Number of responses n (%)		
	Metro	Regional	Total
ICU only	0	3	3 (20)
Home team	3	1	4 (27)
Ward/units	3	1	4 (27)
Standard 9 committee	8	2	10 (67)
Mortality & Morbidity committee	1	1	2 (13)
Other Quality Meetings (Board / Executive)	2	0	2 (13)
Quality manager only	0	0	0
Other (explain)	4	3	7 (47)



2.	Number of responses n (%)		
	Metro	Regional	Total
<ul style="list-style-type: none"> <li>- Code Blues are discussed at Paediatric adverse event Committee. As well as the divisional safety and Quality meeting</li> <li>- Report goes to the Resuscitation Committee and to all HOD to review their MET calls however this is done poorly prob at both levels. If the MET call results in a VHIMS, it may then be reviewed the Quality Managers and/or proceed to have a Critical Incident Review by patient safety</li> <li>- Resuscitation Co-ordinator</li> <li>- We have a paediatric committee that is subcommittee of standard 9</li> <li>- Resuscitation coordinator</li> <li>- And ICU Liaison nurse will follow up</li> <li>- Critical Care Advisory Committee</li> </ul>			

**Question 8: Is there a process for sharing 'lessons learned' from these reviews?**

3.	Number of responses n (%)		
	Metro	Regional	Total
Yes	6	5	11 (73)
No	1	2	3 (20)
Don't know	1	0	1 (7)
<ul style="list-style-type: none"> <li>- Feedback and recommendations are handed down from the above committees</li> <li>- No, unless it's done at department M&amp;M, there is little shared learning's. Recommendations may be made through Patient -Safety.</li> <li>- The deteriorating patient committee will refer any lessons to the Paediatric Emergency Committee (representation from ED and Paeds ward). This will then be distributed to the staff in both the emergency department and paediatric ward.</li> <li>- Riskman occurs about any incident that is an ISR 1 or 2 decision made whether SIT or RCA required. Recommendations are made and go through appropriate QRM and Paediatric resus committee, which is a sub committee of standard 9 and standard 9. Then feed back to staff through inservice, ward meetings, m and m meetings and teaching.</li> <li>- For parent units via M&amp;M process. Data reported at EH Clinical Deterioration Committee and is reported up to Clinical Executive and Board. Data is shared with Site Clinical Deterioration Committees and then shared with wards via ward representatives on these committees.</li> <li>- Yes - to a degree - if issues they end up with Clinical Governance and then usually developed/changed protocol from it.</li> <li>- VHIMS outcomes, Morbidity and Mortality meetings, Deteriorating patient committee recommendations, informal debriefing/emails</li> <li>- Post MET/Code Huddles as required.</li> </ul>			



3.	Number of responses n (%)		
	Metro	Regional	Total
<p>- Feed back to wards involved. Cases with gaps/issues presented to Morbidity and mortality committee after in depth case review conducted in conjunction with ward staff. Overall organisational and unit results presented to all levels of organisation</p> <p>- If the initial review shows any missed triggers, un-followed policies/guidelines or incorrect treatment, an email is sent to the corresponding ward NUM and Educator to follow up and report back to the CCLN with the outcome.</p> <p>- Deteriorating patient committee</p>			

**Question 9: Would the development of standardised paediatric ViCTOR Emergency Call form be useful for your health service?**

4.	Number of responses n (%)		
	Metro	Regional	Total
Yes	4	5	9 (60)
No	0	0	0 (0)
Don't know	4	2	6 (40)

**Question 10: If required, would you be prepared to share any forms that you currently use with us?**

	Number of responses n (%)		
	Metro	Regional	Total
Yes	8	7	15 (100%)

**Question 11: Finally, please feel free to provide additional comments which assist in clarifying for us your current systems and processes?**

<p>- We are now awaiting the paper version of the report to be an automated report via EPIC.</p> <p>- We have a two-tiered system for paediatric deterioration. Initially, Urgent Clinical Review response (like pre-met)- Medical review in person within 30mins (pre-determined abnormal vital signs) and a response Blue Paediatric- for either severely unwell r in cardiac arrest. The criteria for respond blue is based on the vital signs in the ViCTOR chart. The ED response team + senior Anaesthetic Reg + ICU Reg and parent team attend a respond blue paediatric call. Follow up review by Parent team within 30mins if not on site.</p> <p>- Data from MET and premet calls is recorded. It is reported back at paediatric resus committee how many there have been the trends on why they are being called. Recently highlighted an increase due ED and Neonatal now calling METS. It was highlighted that METS are being called in ED at triage before any treatment instigated, this practice is being reviewed.</p> <p>- A standard minimum dataset would be helpful as this would assist with benchmarking with like</p>			
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*organisations. A standard form may not be helpful, as EH has an established system for data collection, entry and reporting which currently works well!*

*- We have a code pink system here which is MET and Code Blue together. All under the same umbrella. We have developed our own paper information collection tool, which then goes to ED for putting into a Code Pink database. At the moment there is a larger database being developed hospital wide for all MET (adult) and Code Blue (adult) and Code pink (Paeds) calls.*

*- Q5: paper form is initially collected during the Emergency event. VHIMS/Riskman is filled in immediate post the emergency event.*

*- Our current process involves all MET Calls/Code Blues being entered onto RiskMan as a quality activity by the ward staff where the event occurred. If there are any gaps, for example observations in trigger zones not actioned, then an incident is also generated. We have MET Call and Code Blue evaluation forms which are completed generally by the responding team (although can be completed by anyone), which are forwarded to the resuscitation coordinator. The resuscitation coordinator currently reviews all events and escalates where necessary. Organisational and unit reports are generated on a quarterly basis*

*- The CCLN collects the Met call information and enters onto RISKMAN and our excel spread sheet. If there are areas of improvement they are forwarded to the ward NUM and Educator. Usually escalating care timely, following P&P etc. All Code Blues receive a full clinical review. If there is a significant error or near miss, the case will be reviewed in depth and strategies discussed and implemented at a Management level*

*- Paper based forms initially used, then data entered in to Riskman/VHIMS by ICU Liaison Nurse. These are then reviewed and discussed at Medical Services Meeting as Part of Standard 9 if required. If needed, in-depth clinical reviews are completed. Lessons from these are usually shared with the home team/NUM for further dissemination to their staff.*



## Appendix C: ViCTOR Medical Emergency Response Trial Form: Information Sheet

### General Instructions

- Trial running from December 1<sup>st</sup> to 2017 April 30<sup>th</sup> 2018
- Complete the form for every inpatient paediatric patient who has a medical emergency response (e.g. MET call or Code Blue)
- Complete in conjunction with usual hospital emergency response forms
- Please remove the Patient Identification details at perforated edge and keep these for your records for the duration of the pilot
- Email completed forms (with patient identification details removed as described above) at least monthly to [victor.team@rch.org.au](mailto:victor.team@rch.org.au)
- If you need any further information please call one of the ViCTOR team (Sharon Kinney 934556369 or Jen Sloane 93455214)
- The below table provides an additional explanation of various elements of the form.

Form Section	Additional Explanation of selected elements
Patient details	<ul style="list-style-type: none"><li>• Admission diagnosis: Primary reason for admission to hospital</li><li>• Presumed reason/diagnosis for emergency call: e.g. respiratory failure, seizure, septic shock. Exact diagnosis may not be readily known at the time of the Call</li><li>• Post-operative &lt; 48 hours: Any surgical operation or procedure that required anaesthetic</li></ul>
Event details	<ul style="list-style-type: none"><li>• Called made by Doctor, Nurse, Family, Other: <i>describe 'other' e.g. physio</i></li></ul>
Reason(s) call made	<p>Tick all reasons that are applicable: includes any concerning change to the physiological variables that prompted the call, which may not necessarily be in the Orange or Purple zone.</p> <ul style="list-style-type: none"><li>• Staff worried, Family worried = <i>any family member, although usually parent or guardian</i></li><li>• Respiratory arrest = <i>cessation of breathing and requiring emergency assisted ventilation</i></li><li>• Cardiac arrest = <i>chest compressions and/or defibrillation administered irrespective of rhythm</i></li><li>• Initial rhythm = <i>describe initial rhythm – indicate 'unknown' if unable to be determined</i></li><li>• Other = <i>e.g. major bleed, severe pain</i></li></ul>
ViCTOR Purple Parameter	Tick all applicable parameters that were in the Purple Zone at the last set of observations prior to the Medical Emergency Call
Existing modification(s) at Time of call	Tick all ViCTOR Purple Parameters that had an existing modification at time of call irrespective of whether the parameter was breached
Significant event	These events have been selected because they are either related to a higher risk of



	<p>mortality, or the severity of illness indicates that avoidable clinical deterioration may have occurred.</p> <p>Tick if any of the following events that occurred during or immediate prior to call (e.g chest compressions given for brief period for bradycardia/hypotension prior to the arrival of the medical emergency team)</p> <p><u>Acute respiratory compromise</u>  <i>Absent, agonal or inadequate respirations that required emergency assisted ventilation as listed below</i></p> <ul style="list-style-type: none"> <li>• Bag mask ventilation</li> <li>• Intubation &amp; ventilation</li> <li>• Initiated high flow O<sub>2</sub></li> <li>• Initiated/Escalated CPAP or BiPAP</li> </ul> <p><u>Cardiac arrest</u>  <i>(No pulse or pulse with inadequate perfusion requiring chest compressions and/or Defibrillation (VF/VT))</i></p> <ul style="list-style-type: none"> <li>• Chest compressions <i>(describe initial rhythm – indicate ‘unknown’ if unable to be determined)</i></li> <li>• Defibrillation</li> </ul> <p><u>Other</u></p> <ul style="list-style-type: none"> <li>• Initiated/Escalated inotropes <i>(e.g. dobutamine infusion)</i></li> </ul>
Patient Outcome Post call	<ul style="list-style-type: none"> <li>• Resolved without intervention e.g. medical emergency team informed on arrival that they were not required</li> <li>• Remained on ward with advice/or intervention (e.g blood cultures requested, suctioning and repositioning of child)</li> <li>• Internal hospital transferred to: HDU, ICU, ED, Theatre, Other: (Describe: Other eg Radiology)</li> <li>• Transferred to another hospital: Monash Children’s, RCH, Other – name other hospital</li> <li>• List any ViCTOR purple parameters that were modified as an outcome at the medical emergency call : e.g upper RR</li> </ul>



## Appendix D: ViCTOR Medical Emergency Response in Trial Summary Data

Table 1 - Responses Per Pilot Site							
Hospital	DEC 17 (N=54)	JAN 18 (N=48)	FEB 18 (N=54)	MAR 18 (N=66)	APR 18 (N=64)	Total (N=286)	%
1	1	-	2	-	1	4	1.40
2	-	1	3	1	1	6	2.10
3	6	2	3	4	1	16	5.59
4	1	1	2	3	1	8	2.80
5	-	-	-	-	-	-	-
6	-	-	1	1	-	2	0.70
7	-	1	1	-	-	2	0.70
8	16	15	14	17	22	84	29.37
9	30	27	28	39	37	161	56.29
10	-	1	-	1	-	2	0.70
11	N/A	N/A	N/A	N/A	N/A	N/A	N/A
12	-	-	-	-	1	1	0.35

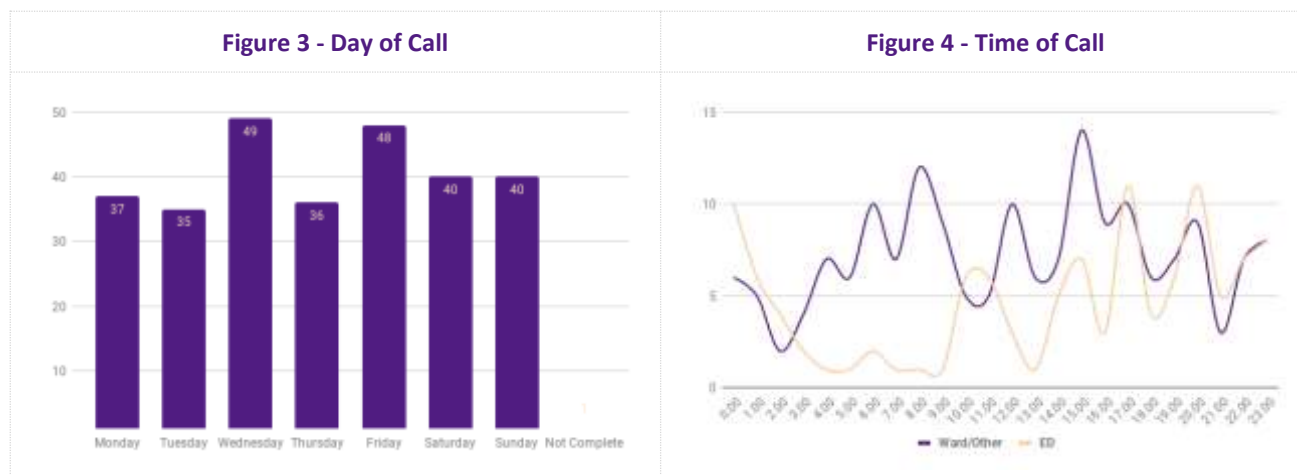
- In total there was 286 medical emergency calls across 10 pilot sites for the duration of the trial.
- One pilot site had no medical emergency calls and data was not available from one pilot site.
- Of the 286 calls, 232 were unique patients, indicating multiple calls were made for the some patients. For the purpose of this report, it is based on the number of calls.

Table 2 - Medical Emergency Responses Per Caller		
	(N=286)	%
Doctor	11	3.85
Nurse	267	93.36
Family	2	0.70
Other	3	1.05
Incomplete By Site	3	1.05





- The majority of calls were initiated by nurses.
- The median duration of each call was 20 minutes (*ranging from 4 Minutes to 4 Hours 15 Minutes*).



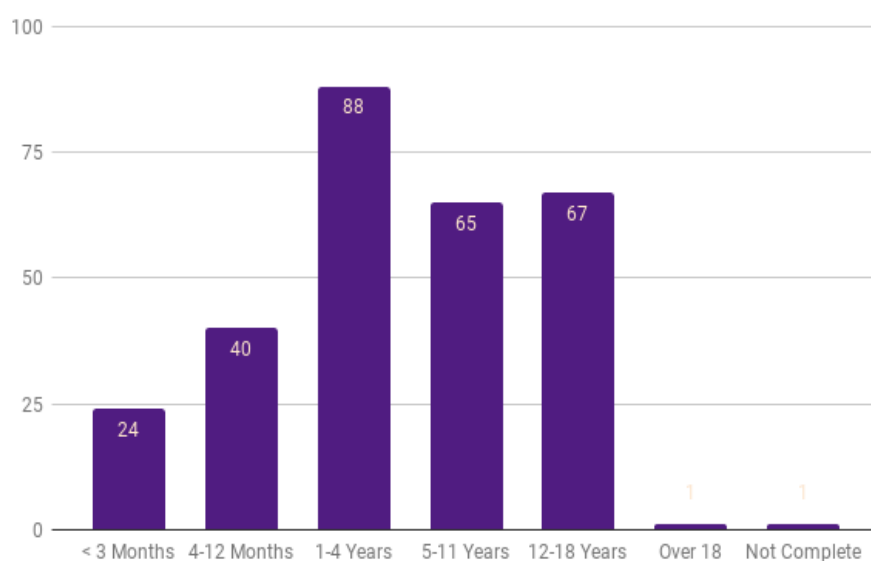
- The majority of calls were made on a Wednesday and Friday.
- Figure 4 differentiates time of call according to location of call ie ward/other versus ED
- The peak time of call was between 15:00 - 15:59 for ward patients, and between 17:00 - 17:59 and 20:00 - 20:59 for ED patients

Table 5A - Location of Call		
	(N=286)	%
Ward	164	57.34
ED	112	39.16
Other	10	3.50
Table 5B - Location of Patient < 4 Hours prior to call		
Transferred From:	(N=286)	%
ED	33	11.54
ICU	1	0.35
Recovery	15	5.24
N/A	237	82.87

- Almost 60% of calls were made in the ward. The relatively high percentage of calls in ED reflects the local procedures from one pilot site, which also had the greatest number of emergency response calls
- 30% of the ward patients (N=164) had transferred from ED or Recovery during the 4 hours prior to the call.



**Figure 6 - Age Group**



- The majority of children were between 1-4 years

**Table 7 - Admission Diagnosis**

Admission Diagnosis:	(N=286)	%
Respiratory	91	31.82
Neurological	46	16.08
Gastrointestinal/Renal	33	11.54
Miscellaneous	75	26.22
Postoperative (Non-Cardiac)	27	9.44
Cardiovascular (Inc. Post-Op)	6	2.10
Injury	5	1.75
Incomplete By Site	3	1.05

Admission diagnoses are classified according to the Australian and New Zealand Paediatric Intensive Care Registry (ANZPICR) codes (2017).

- Within the miscellaneous category, 11 children had presumed sepsis, 1 child febrile neutropenia, and 18 children had an unknown febrile illness (\*includes one admission with no documented admission diagnosis).
- 22 (7.6%) children had surgery within the previous 48 hours of the medical emergency call.

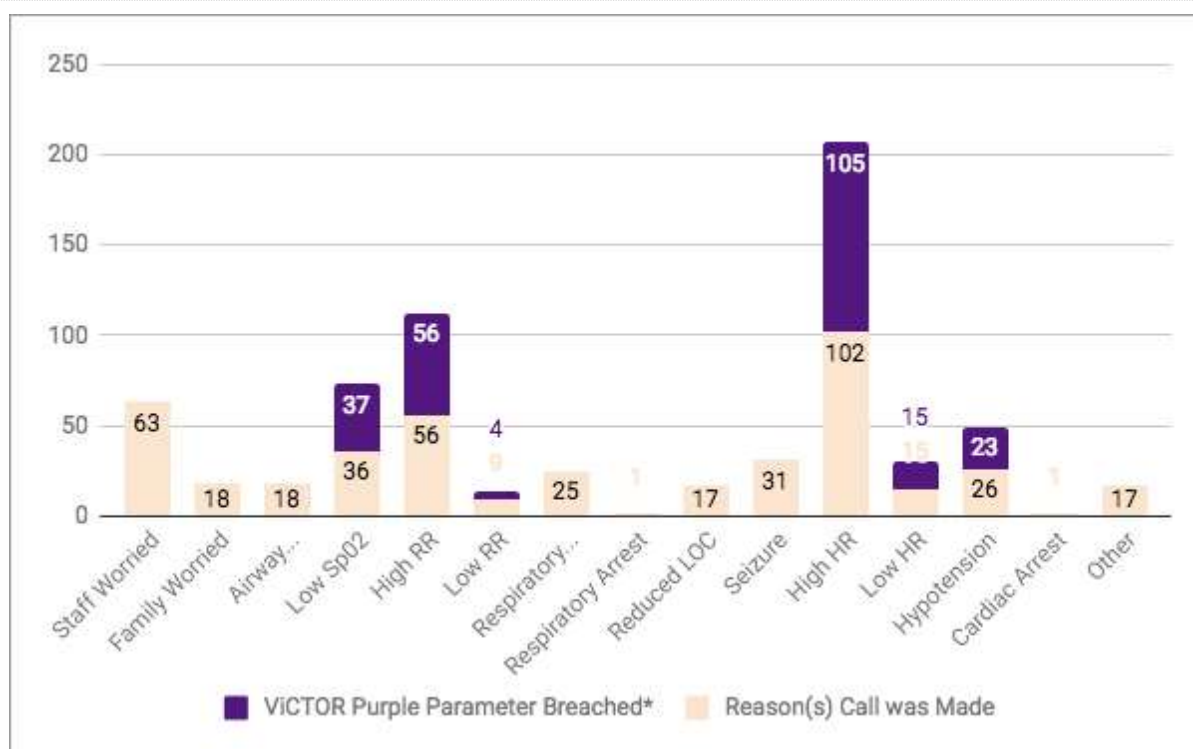


**Table 8 - Presumed Reason / Diagnosis for the Call**

	(N=286)	%
Airway	11	3.85
Circulatory	117	40.91
Neurological	42	14.69
Other	37	12.94
Respiratory	77	26.92
Unknown	2	0.70

- The presumed reason for the call was categorized into broad categories as shown in Table 8
- Figure 9 summarises the specific reasons for call (multiple reasons could exist) and whether a ViCTOR purple parameter was breached
- 19 modifications of the purple parameters prior to the time of call were for: Low SpO<sub>2</sub> (N=2), High HR (N=11), High RR (N=7) and Low RR (N=1) and low BP (N=1)

**Figure 9 - Reason(s) Call was Made / ViCTOR Purple Parameter Breached**



Airway... = Airway Compromise

Respiratory... = Respiratory Distress

NB: ViCTOR Purple Parameter Breached - Only applies to Low SpO<sub>2</sub>, High HR, Low HR, High RR, Low RR and Hypotension

- Off the 286 calls made over the duration of the trial, 83% had at least one ViCTOR Purple Parameter Breached



Table 10 - Significant Events		
	(N=286)	%
Bag Mask Ventilation	9	16.36
Intubation and Ventilation	6	10.91
Initiated High Flow O2	23	41.82
Initiated/Escalated CPAP or BiPAP	6	10.91
Cardiac Arrest	3	5.45
Reversal of Opioid Toxicity (Naloxone)	2	3.64
IM or IV Adrenalin	2	3.64
Initiated/Escalated Inotropes	2	3.64
Reversal of Sedation (Flumazenil)	-	-
Extensive Fluid Resuscitation (≥40 mL/kg)	2	3.64
Total	55	100

- The number of significant events are shown in Table 10.
- Some children had multiple types of significant events, usually requiring additional interventions such as intubation, adrenaline, fluid resuscitation or inotropes in association with the cardiac arrest
- Three children had a cardiac arrest:
  1. An infant presenting to ED with nausea and vomiting and subsequently died
  2. An infant in theatre with laryngospasm
  3. A toddler post T & A surgery on the ward who was subsequently transferred to RCH

Table 11 - Patient Outcome Post Call According To Call Location					
Patient Outcome Post Call:	Ward	ED	Other	Total (N=286)	%
Resolved without intervention	4	3	1	8	2.80
Remained on ward with advice/intervention	135	98	6	239	83.57
HDU	-	4	-	4	1.40
ICU	15	1	-	16	5.59
ED	4	1	1	6	2.10
Other (Transferred to Another Hospital)	3	4	2	9	3.15



Table 11 - Patient Outcome Post Call According To Call Location					
Theatre	1	-	-	1	0.35
Unknown	2	-	-	2	0.70
Died	-	1	-	1	0.35
Total	164	112	10	286	100

- % of patients were escalated to a higher level of care (e.g ICU, HDU or Transferred to Another Hospital)
- PIPER was consulted on 17 occasions
- 5 Parameters were modified during the medical emergency response; Low RR, Low HR, High RR and high HR (N=2).
- 2 Children that were transferred to ICU and were later transferred out to another hospital.