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Article

Pediatric Postoperative Recovery – It's Not Just about the Technology

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Abstract: Background: Measuring vital signs has always been a central task for Critical Care Nurse's (CCNs) and Registered Nurse Anesthetist's (RNAs) providing care in the post-anesthesia care unit (PACU) and a prerequisite for their decision-making. Properly measuring and understanding pediatric vital signs is a challenge in younger pediatric patients up to 36 months old. Purpose: gain a greater understanding of CCNs' and RNAs' perceptions of decision-making regarding the level of vital sign monitoring children require in the PACU. Method: A qualitative study design involving the critical-incident technique was used. Interviews were carried out with a purposeful sample of CCNs and RNAs (n=17) from two different hospitals. Findings: According to the nurses' experience, grounds for decisions concerning children's need of vital-sign monitoring were both adequate and inadequate. They used actions to adjust the monitoring of vital signs to optimise conditions for assessment and the prospects of a safe recovery for the child. Conclusions: Evidence-based care and safety are compromised when the technology has limitations and is not adapted for children. Its use means that experience and clinical assessment are relied on to a greater extent. This not only makes experience important for reliable assessment, but also means that greater risks are accepted.

Keywords: apnea; competence clinical; clinical skills; hypoventilation; monitoring; patient safety pediatrics; postoperative period; vital signs

1. Introduction

In the past five years, the population of younger children undergoing surgery has grown. In 2021, 15 281 surgical procedures for children up to four years old were performed in Swedish inpatient care, while most surgical interventions (27 563) were on a routine, planned and outpatient basis (Swedish National Board of Health and Welfare, 2021). Improvements due to enhanced patient safety and advanced surgical procedures for younger children, in all aspects of surgery as surgical checklist application (Oak et al., 2015). Including anaesthesia safety with pediatric airway management, have a major bearing on the safety for rise in numbers (Hsu et al., 2021). Postoperatively in the PACU, vital signs indicate the child's current physiological status. They include respiratory rate, heart rate, blood pressure, temperature and pain level. To predict and prevent clinical deterioration, observation and assessment of vital signs are crucial for the nurses and for their decision-making (Apfelbaum et al., 2013). The frequency of postoperative vital-sign measurement in every institution typically follows guidelines issued by the American Society of Anaesthesiologists (ASA) (2019) or the European Society of Anaesthesiology and Intensive Care (ESAIC) (n.d). These guidelines are based on such factors as anaesthesia type, surgical site, clinical status, co-morbidities and the care provider's orders (ASA, 2019; ESAIC, n.d). Since the guidelines are recommendations, rather than established care standards, individual institutions determine their own population-

specific departmental policies and protocols. In the PACU, the optimal way to perform monitoring for children under anaesthesia is to provide an environment adapted to the child's needs and prepared for critical care. This is because of the potential for rapid physiological deterioration to occur at any time as children emerge from general anaesthesia (ASA, 2019). In European PACUs, the anaesthesiologists are most commonly responsible for the care provided, in teams alongside advanced practice registered nurses (Vimlati et al., 2009). However, concerning evidence of and guidelines on frequency of vital-sign monitoring at PACUs and

the impact of such documentation on outcomes, Zeitz & McCutcheon (2006) found that the frequency of vital-sign collection in the first 24 hours after surgery, including time spent in the PACU, has often been routine-based. Research on CCNs and RNAs experience of vital-sign monitoring and how they make decisions regarding postoperative children is lacking. In this study, the aim was thus to gain a greater understanding of CCNs' and RNAs' perceptions of decision-making regarding the level of vital sign monitoring children require in post-anaesthesia care units.

2. Method

2.1. Study design and setting

The critical incident approach was chosen for this study because it is well suited to understanding the complexity of an organisation and human interactions (Schluter et al., 2008). Critical incident technique a process for collecting key details of human behavior during specific incidents of great relevance, critical incidents (Flanagan, 1954; Fridlund et al., 2017). Individual semi structured interviews were held using Fridlund et al. (2017) interview guidelines. Ahead of data collection, two pilot interviews were conducted. Questions were then adapted to the situation and context, and the pilot interviews were excluded from the results. The study was conducted at two PACUs, each providing postoperative care for children. One at children's hospital was for those who had undergone minor and major surgery. The other at a hospital for both children and adults for children who had undergone head and neck surgery and radiological examinations.

2.2. Participants

The participants in this study from two centra (n=17) were CCNs or/and RNAs. They are working either at specialist child's hospital PACU or at a hospital with both adult and children PACU. At the child's hospital the RNAs worked in both PACU and operating room. See Table 1. CCNs and RNAs sociodemographic and professional characteristics.

Table 1. CCNs and RNAs (n=17) sociodemographic and professional.

characteristics	Median	Range
Age, years	53	31->60
Number of years' healthcare experience	34	10->31
Number of years as trained specialist nurse	20	1->31
Department		
Working in PACU at children's hospital	9	
Working in PACU with both adults and children	8	

Purposeful sampling was used to ensure recruitment of CCNs and RNAs from the two settings, with experience of monitoring children in this context aged 0–36 months, meaning infants (0-1 years) and toddlers (1-3 years). At each PACU the head of department was contacted to find informants appropriate for the inclusion criteria and who were willing to participate in the study. Those who agreed were telephoned and given further oral and written information about the study. Written information about the study was then sent home. They were invited to read the information and they were given time to decide participation or not. They were then contacted anew, and face-to-face

interviews were arranged for prospective participants, who gave their consent in writing before the interviews started.

2.3. Data collection

In total, 17 individual semistructured interviews were held in February 2022: one on Zoom and the other 16 at the interviewee's workplace, in privacy, during working hours. The interviews were conducted by four master's students, under the supervision of the first author. All sound was recorded using external device and transcribed verbatim. The participants were informed in advance that the interviews would focus on critical incidents in relation to decision-making about monitoring of children in the PACU. The duration of the interviews ranged from 10 to 28 minutes. The authors agreed that data saturation was reached when the number of critical incidents was "satisfactory", in the sense that the interviewees were beginning to repeat remarks made in previous interviews.

2.4. Data analysis

The data analysis, performed in accordance with critical incident technique, started with reading of the transcripts from the interviews to gain familiarity with the content. Critical incidents related to the aim were identified and picked out as illustrating either good or poor decision-making. This was followed by a structural analysis using critical incident (Flanagan, 1954). Meaningful experiences and actions were extracted from the data, labelled, and compared in terms of similarities and differences for grouping in subcategories. The subcategories were then labelled and corresponding comparisons among them were made for sorting into categories. From the categories, the main areas relating to experiences and actions emerged (Flanagan, 1954; Fridlund et al., 2017). The first author was mainly responsible for the analysis and furthermore discussions among all the authors took place throughout the process until a consensus on the definitive main areas, categories and subcategories was reached.

2.5. Ethics

Ethical approval was granted by the Swedish Ethical Review Authority (ref. 2022-00896-01). The study complies with the Helsinki Declaration.

3. Results

The CCNs and RNAs references to decision-making about children's needs of vital-sign monitoring concern electrocardiograms (ECG)s, pulse oximetry, and invasive and non-invasive blood pressure measurement. From 241 critical incidents, two main areas in the participants experience of monitoring children in PACUs have emerged: adequate and inadequate grounds for decisions. Within these two areas, there were nine categories and subcategories (Table 2). In the CCNs and RNAs actions relating to the child's monitoring, there was one main area, adjusting of the monitoring, comprising three categories and subcategories (Table 3)

Table 2. Summary of subcategories, categories, and main areas of the CCNs and RNAs experiences of monitoring children in the PACU.

Subcategories	Category	Main area
Standard monitoring for various interventions (10) * Routines followed (8)	Prescriptions and guidelines	Adequate grounds for decisions
Dialogue/prescription with doctor or nurse in charge (8)		
ECG connection provides graph of breathing (6) ECG used for heart rate and rhythm (8) Pulse oximetry as a technical aid (13)	Potential of technology	
Experience is important (14) Sense of impending change for the worse (11) Transfer to nurse anaesthetists from operation staff for recovery from anaesthesia (4)	Clinical assessment	

Adaptation to what happened in the intraoperative period (6) Child-centred approach and individualisation (15) Child's age (5) ASA class, state of ill-health (5)	Child's health status	Inadequate grounds for decisions
Parents know their children, are close by, provide security and/or perceive change promptly (8)	Participating parents	
Need to be prepared for unusual and/or complex emergency situations (7) Keeping calm in critical situations (2)	Situational awareness	
Delay in readings displayed if child's condition worsens (3) Positioning may result in incorrect readings (5) Agitated child, pain, hunger, restlessness and/or strange situation cause incorrect readings (4) Difficult to measure blood pressure reliably in very young children (3) Technology must be used at more frequent intervals for correct assessment (1)	Limits of technology	
Existing scope for monitoring not used (1) Child's ill-health means that lower saturation level is important; correction of alarm thresholds necessary (1)	Inappropriate use of technology	
Decision on level of monitoring made intraoperatively (3) Wrong level of care; child who needs more resources than are available (4)	Decision by previous caregiver	
Regular unit closes and child has to be transferred from there (1)		

* Number of incidents in brackets.

3.1. Adequate grounds for decision

3.1.1. Prescriptions and guidelines

The CCNs and RNAs followed the guidelines closely for every child. In addition, they engaged in a dialogue, about adherence to prescriptions and guidelines, with the physician in charge and health professionals at other units involved in the child's care. The guidelines provided support when difficulties arose, a child was disturbed by the monitoring and the children's parents and/or the nurses' colleagues asked questions.

3.1.2. Potential of technology

The CCNs and RNAs prioritised pulse oximetry and they attempted to maintain it when the children were recovering from anaesthesia. Pulse oximetry was valuable for monitoring heart rate, detecting arrhythmias and inspecting the child's airway and breathing. Moreover, when children needed opioids, sedatives and/or oxygen therapy during their recovery, pulse oximetry was crucial to monitoring and evaluation. The primary purpose of ECG monitoring was to detect arrhythmias, but seeing the heart rate on the monitor was valuable since finding a pulse on young children is difficult, and when they wake up the pulse may rise from 140 to 180 beats per minute. Moreover, the monitor display of children's respiratory rate when an ECG is in progress is especially useful to supplement the clinical assessment.

3.1.3. Clinical assessment

Experience of and skill in clinical assessment were described as having a major impact on decisions about the child's monitoring in the PACU. Furthermore, they meant having intuition and being able to sense impending changes in the child's condition. The PACU at the children's hospital was staffed by the same RNAs who worked in the operating theatre. The RNAs believed that this

was a positive determining factor for their work and decisions about the monitoring of children in the PACU.

3.1.4. Child's health status

Besides the guidelines, decisions on children's monitoring during recovery in the PACU were based primarily on what had happened in the intraoperative period. Furthermore, decision-making involved an individualised, child-centred approach to monitoring. It was adapted, for example, to children with special needs; children who, owing to their diseases, frequently returned to the PACU; and unique situations that might affect any child.

3.1.5. Participating parents

The participants emphasise the importance of involving the parents during the child's recovery. The involved parent is a resource for the child in the unfamiliar environment. Parents know their children, and the CCNs and RNAs describe them as an asset. They can see changes in their children and confirm the child's usual status.

3.1.6. Situational awareness

The participants were aware of the importance of being prepared for uncommon, complex and/or acute situations in relation to decisions related to the children's monitoring. The CCNs and RNAs emphasised the importance of being calm in such situations and trusting their own clinical assessment.

3.2. *Inadequate grounds for decision*

3.2.1. Limits of technology

The CCNs and RNAs were aware of technical limitations. Their perception was that they could see changes in the child clinically before these showed on the monitor. The pulse oximeter is often fitted peripherally on the children's small fingers where the circulation is poor, which makes measuring more difficult and gives rise to low values. Overall, this naturally implies a delayed alarm function. It also means that, to serve as a reliable basis for assessment, assessment through monitoring must be prolonged.

In general, the participants find it hard to obtain reliable values from all types of monitoring when the children are recovering from anaesthesia, becoming alert and starting to move. Pain, hunger, anxiety and the unfamiliar situation are other reasons for errors in measuring the children at this time. Non-invasive measurement of babies' blood pressure is particularly difficult: it stresses them, makes them agitated and causes decisions based on incorrect figures. Positioning of the equipment may be another cause of incorrect readings. Both the pulse oximeter and the ECG electrode can get stuck on the child's blanket.

3.2.2. Inappropriate use of technology

This may occur because decision-making is a matter of balancing what the monitoring adds to assessment of the child against the discomfort that monitoring may entail, which in turn may lead to other problems for the child, noninvasive blood pressure monitoring is this kind of measure, and careful consideration therefore takes place before and while blood pressure is measured. Another example is not taking the opportunity to use the ECG to monitor breathing, which would enable any impairment to be detected earlier. Moreover, children with heart failure may have a lower saturation level in their habitual state. It is then important to adjust alarm limits to the child's habitual values to avoid incorrectly based decisions.

3.2.3. Decision by previous caregiver

A common situation for the CCNs and RNAs is that decision-making about the level of the child's postoperative monitoring is carried out perioperatively. Even at the children's hospital, where the RNAs in the PACU also worked in the operating theatre, the RNAs did not always agree with their colleagues' decisions. On other occasions when disagreements arose, these concerned what the nurses regarded as the wrong level of care given to children who needed more resources than were available. This could occur when the ordinary unit closed, when the child's care and treatment there might be transferred to the CCNs and RNAs.

Table 3. Summary of quotations, subcategories, categories and main areas of the CCNs and RNAs actions connected with the child's monitoring.

Quotations	Subcategories	Category	Main area
"So we disconnect it when they come in from the operation, or we ask the anaesthetic staff not to keep doing the ECGs and blood pressure monitoring. We don't have it on any children."	Remove monitoring in advance (1) *	Reducing interference caused by monitoring	Adjusting the monitoring
"When they get so irritated and cross, and scream and just thrash their feet around, because then there's a risk of them pulling out the peripheral venous catheters and everything that entails, or the central venous catheters as well, so that you really have to remove the pulse oximeter."	Remove monitoring (7)		
"We have extremely little monitoring – we take off what we can."	Remove as much as possible (3)		
"If they've woken up and had something to eat, then they don't need monitoring any more anyway, generally speaking."	Remove monitoring when they are picked up and held (10)		
"Because we don't want to disturb them. They need to get plenty of sleep after having their anaesthetic, with all the medication. If they wake up too early, we get a real uproar here, you see. They toss around, and they're just not themselves."	Keep monitoring (8)	Monitoring based on the current situation	
"Where something has happened during the operation that results in the child needing to be monitored more clearly."	Extended monitoring (1)		
"Usually once you've administered the morphine, they calm down and then you can put the pulse oximeter back again."	Option of reconnecting the equipment (6)		
"And then you have to, sort of, just sneak it on for a short while, and then you can take it away again, for instance. Then all you can do is hold still for a couple of seconds and say 'finished', and then we take it off, and so it goes on."	Intermittent checks (7)		
"On the other hand, if you were to have masses of children at the PACU on some occasion, that you don't really have a chance to look at them that much – then perhaps	Keep the monitoring equipment on when there are a lot of children in the PACU and/or at night (1)		

you should be more cautious about removing the monitoring."			
"Then we send everything with the child to the department as well. So then they can decide when to remove it, because it's much easier to remove the stuff than to put it back again."	Keep the monitoring on when the child is sent to the department (1)		
"Is it worth waking up the child so as to, perhaps, then take an extra blood pressure reading? Or should we let the child sleep?"	Refrain from monitoring (2)		
"And then we ask the doctor whether it's OK for us just to use a pulse oximeter in here."	Doctor's prescription (6)		
"Yes, that's how it is: having had long experience, I've learnt a thing or two about what can happen and what should happen. So I don't always contact the doctor every time."	Personal decision (4)		
"Then you turn them off. You have to be there anyway, keeping an eye on them anyway, all the time."	Change the alarm limits (4)		
"You also do a tremendous lot of watching how the children are breathing, and of course check whether the alae nasi are moving or retracted, whether there's stridor, and that sort of thing."	Breathing patterns (7)		
"I watch the child closely, you could say. I touch the child and look, without staring, to see the skin tone, sweat on the forehead, mimicry, rigidity, how the hands are opening and shutting, I take the hands and feel whether they're tense, and I watch and listen to the breathing."	Use one's own senses in the observation (9)		
"Then I may skip the monitoring and just look at them. But then you really look at them — then you can't sit at a distance, in front of the computer or anything like that. You really have to be close by if you don't have any monitoring on at all."	Near the child (4)		Non-medical technical assessment
"You have another person there, after all, but you absolutely mustn't ask too much of the parents. You've got one other person who knows them and who knows about what's normal and what isn't."	Get the parents involved (4)		

* Number of incidents in brackets.

3.3. Adjusting the monitoring

3.3.1. Reducing interference caused by monitoring

The monitoring vexes the children. To avoid the children becoming agitated and a situation in which they might pull out peripheral and central venous catheters, the health professionals in the operating theatre removed as much as possible of the monitoring equipment before the child arrived in the PACU. When children seemed to be disturbed by the monitoring, as much as possible of the

equipment had to be removed. One situation that was decisive for discontinuing the monitoring was when the child, held in the parent's arms, was trying to feed. The monitoring equipment was then a hindrance, and the most frequent decision was that the child was sufficiently wide awake not to require monitoring. The CCNs and RNAs were unanimous in their view that if everything looked fine, children should not be touched in any way on arrival in the PACU. They should, in other words, be allowed to remain under anaesthesia and come round naturally, when they are ready. The interviewees expressed the hope that they would then wake up in a tranquil state.

3.3.2. Monitoring based on current situation

However, depending on what happened during a child's perioperative period and recovery in the PACU, the monitoring may have needed expanding. This decision can be based on the clinical assessment. It is also common for monitoring to recommence, often in connection with children receiving painkillers or sedatives. Another means of adjustment is to take measurements intermittently, mostly with a pulse oximeter, or to leave the blood pressure cuff on and connect the cord when the opportunity to measure arises. Sometimes monitoring is maintained to a high degree when there is a heavy workload or during the night shift in the PACU. In the CCNs and RNAs view, they then did not have the same opportunity to be close to the children and observe them and were therefore more cautious in their decisions to discontinue the monitoring. Sometimes they left it connected and let the receiving specialist nurse take the decision. On the other hand, if the child had good readings on the pulse oximeter curve, experienced CCNs and RNAs might decide to stop the monitoring. Moreover, since faulty alarm signals from the monitors can be very disturbing for children and parents, alarm settings were sometimes changed to create a more soothing environment. On these occasions, the CCNs and RNAs increased their observations of and presence with the children and used their clinical judgement.

When they disconnected the monitoring, it was because it added nothing to their assessment.

3.3.3. Non-medical technical assessment

As part of their clinical assessment, the CCNs and RNAs observed the children's breathing patterns. All their senses were used in their overall assessment: they listened, looked and felt to assess skin tone, sweat on the forehead, facial expressions, stiffness, motor skills and capillary refill. Depending on the specific surgical intervention done, they were aware of the various complications that might arise during the child's recovery. They describe being near the child's bedside all the time, so that they could immediately detect changes in the child's condition, especially if no monitoring was taking place. Parents, too, were important, and some of the participants used them as a part of their assessment.

4. Discussion

Uniform recovery assessment involves several difficulties. Guidelines highlight the importance of reliable vital-sign monitoring to indicate children's current physiological status in the PACU (ASA, 2019). The most common complications were respiratory, and risk factors had to be considered and optimised before the children's surgery, with a purpose and a plan for monitoring of vital signs for a safe recovery from anaesthesia and surgery (Mamaril, 2020). However, implementing such a plan was problematic, and the absence of guidelines about the frequency of vital-sign monitoring was one reason why (Zeitz & McCutcheon, 2006).

The transfer of children from the operating theatre to the PACU may be a critical stage, since adverse events tend to occur during the child's first 30 minutes in the PACU. This also highlights the need for CCNs and RNAs who are skilled in advanced airway management to work in PACUs (Vishneski et al., 2021). Decision-making about monitoring vital signs in the PACU at the children's hospital was based primarily on local guidelines; the child's age, classification of American Society of Anesthesiologists and state of ill-health; and events during the intraoperative period. The PACU was, as mentioned, staffed by the same RNAs who worked in the operating theatre. Nonetheless, the

RNAs did not always agree with their colleagues' decisions about the level of monitoring. The nursing literature confirms this and illustrates the complexity of how experience best benefits acute medical decision-making (Nibbelink and Brewer, 2018). The CCNs and RNAs used a combination of clinical assessment and monitoring of vital signs to assess the children's recovery. Their perception was that experience of and ability in clinical assessment had a major impact on decisions about children's need of monitoring, as grounds for decision-making. This is well known but controversial. However, an integrative review shows that intuition has a place alongside research-based evidence and favours a nursing process based on knowledge and care experience — a basis for decision-making that supports safe patient care (Melin-Johansson et al., 2017). An example of incorporating evidence into nursing practice is the NEWS 2 scoring system in which, besides the assessment, nurses are urged not to wait for the patient to "trigger" and escalate their concerns before they act (NEWS-24, 2018).

The participants assessment may also involve the parents, whose knowledge of their children makes them an asset, in the CCNs and RNAs view. This may be problematic if the parents do not really want to get involved. Awareness of the parents' experience and needs for varying degrees of involvement is vital for compassionate postoperative care (Thomi et al., 2019). Staff may have differing opinions on whether parents should evaluate the child's status in the PACU. The CCNs and RNAs have technical limitations and difficulties in obtaining the children's acceptance of vital-sign monitoring. In general, they think that getting reliable measurements from all types of monitoring is problematic when children are recovering from anaesthesia. Wireless solutions, such as camera-based techniques to monitor vital signs, have been used in neonatal care. But camera settings and environmental parameters influence accuracy (Selvaraju et al., 2022). The technique therefore probably has no contribution to make to monitoring vital signs in paediatric postoperative care. Children undergoing surgery are, in general, healthier than adults. However, owing to younger children's smaller reserves and immature organs, there are limits to their ability to compensate for complications that may arise during the perioperative period (Di Cicco et al., 2021). Another highly important factor for risks of postoperative adverse events is, of course, the child's classification of American Society of Anaesthesiologists. The CCNs and RNAs relate how they use strategies such as situational awareness to be prepared and reduce postoperative adverse events. Tower et al. (2012) thinks that situational awareness also includes perceptions about patients' progress during the hospital stay. This tallies with the perceptions of the participants in this study that experience also means foreseeing changes in the child's condition. For CCNs and RNAs in this study, clinical assessment of the child's breathing is crucial. They are near the child's bedside constantly, to immediately detect changes in the child's condition, especially if the child has not accepted the monitoring and it is discontinued. The CCNs and RNAs point out the importance of the monitoring and how valuable it is to them when clinical assessment is difficult and subject to limitations. Pulse oximetry is considered the most valuable technique, and it is the one most used by the participants. Notable in the context is the study by Pedersen (2005) showing that pulse oximetry can detect hypoxemia and associated events; but randomised controlled trials (RCTs) were unable to show improvements in outcomes. Capnography, in addition to pulse oximetry, may afford an opportunity to detect respiratory adverse events earlier and thus reduce their degree of severity. However, more research is needed and RCTs are necessary, as McNeill & Tabet (2022) show in their "Narrative Review and Synthesis".

Further problems for the younger children are related to their tolerance of the monitoring and the risk of acute agitation, which is common after anaesthesia. This may, moreover, cause great anxiety for the patient, family and caregivers, as well as concern for the child's physical safety (Hoch, 2019). The CCNs and RNAs therefore make adjustments, depending on the children and their current situation, to achieve an individualised, child-centred approach to the child's monitoring. Their decision-making means constantly adjusting the level of monitoring and finding other options, where necessary, when they are monitoring the child's vital signs with the aim of ensuring a safe recovery.

5. Strengths and limitations

This descriptive study has a qualitative approach that conforms to the Consolidated Criteria for Reporting Qualitative Research (Tong et al., 2007). To boost reliability, confirmability, and transferability, and reduce influence on the authors' pre-understanding in this study, they followed the five steps for critical incident carefully (Flanagan, 1954; Fridlund et al., 2017). They identified the aim and incidents, selected the participants and collected the data using Fridlund et al. (2017) interview guidelines, analysed the data in discussions with the research team, with their discussions and knowledge of the study context and critical incident methodology; and presented the results by describing, explaining, comparing, reflecting on and ultimately exploring their implications (Fridlund et al., 2017). However, in a study like this the results invariably depend on how well the informants remember and can describe the incidents requested, and the interviewer's ability to induce the informants to describe them.

6. Conclusion

The results of this study show that the participants have similar experiences and use the same actions when they keep on monitoring for vital signs on awake children regardless of which of the two centers' PACU. It is challenging, knowledge, correct management and understanding how the monitoring helps in the assessment of the child are highly important for patient safety. To obtain a uniform assessment of children' recovery at PACUs and increase evidence included general guidelines is needed. Achieving this requires monitoring equipment adapted to the needs of children aged 0–36 months. This, in turn, would enable monitoring and measurement of vital signs at predetermined time intervals.

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