BMJ Open Quality

Implementation of nursing-led follow-up service for patients newly discharged from paediatric intensive care units: quality improvement initiative

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To cite: AlZaher RA, Murabi I, Enazi J, *et al*. Implementation of nursing-led follow-up service for patients newly discharged from paediatric intensive care units: quality improvement initiative. *BMJ Open Quality* 2023;**12**:e002148. doi:10.1136/bmjoq-2022-002148

Received 11 October 2022
Accepted 21 March 2023

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ABSTRACT

Background Human resource shortages are a global challenge in the healthcare system and create barriers in providing timely follow-up visits for paediatric patients discharged recently from the intensive care unit (ICU). Relying on experienced intensive care nurses to provide follow-up services for patients post paediatric ICU (PICU) transfer has been proven a cost-effective and safe practice. This study aimed to achieve no delays in initiating follow-up visits and to assess the safety of implementing a nurse-led follow-up service.

Methods Plan–Do–Study–Act cycle was used targeting to achieve no delay in initiating follow-up visits and to maintain the safety of the patients. This cycle resulted in the implementation of a nurse-led follow-up service, which is under the provision of a paediatric rapid response team (RRT). Fifteen PICU nurses were trained in their new roles and responsibilities. Service databases were established to track and trend the frequency of visits, service safety measures and clinical deterioration.

Results After the implementation of the nurse-led follow-up service, we achieved no delays in initiating the follow-up visits. 45% (n=487) of patients received a nurse-led follow-up visit service. Safety measures demonstrated 0.21% (n=1) recorded events of RRT activations during the follow-up service. RRT activation within 48 hours from service discharge was 1.2% (n=6), and readmission to PICU within 48 hours was 0.8% (n=4). No cardiopulmonary arrest event was recorded for patients under the nurse-led follow-up service during the service, postservice discharge or postreadmission to PICU.

Conclusions Implementing nursing-led service has been shown to be safe, efficient and provides patients with timely visits post-PICU discharge.

INTRODUCTION

Newly discharged patients from the paediatric intensive care unit (PICU) are categorised as high-risk patients recovering from the acute stage of their illness.[1] The readmission rate in this population is an indicator of the quality of critical care.[2] These patients experience physiological, psychological, cognitive and behavioural changes. The degree of adjustment varies depending on multiple factors.[3] Numerous quality improvement initiatives have been implemented to target this group of patients to prevent clinical deterioration leading to PICU readmission.

Clinical deterioration commonly occurs within the first 48 hours after discharge from the PICU.[4] It leads to worsening patient condition, as indicated by increased mortality rate, resuscitation, the requirement for a high level of care and prolonged hospitalisation.[5] Some factors have been identified in previous studies as the primary causes of clinical deterioration of PICU discharges. These include PICU bed capacity, staff shortage and premature discharge of patients. Notably, 62.5% of unplanned PICU readmission is due to worsening of the primary condition.[6]

Nursing-led services have been proven safe and cost-effective, reducing the readmission rate to critical care units and hospital mortality.[7] They may also improve patient outcomes during hospitalisation.[8] Delivering nurse-led service involves different modalities, including the critical care outreach team, ICU liaison nurse and rapid response team (RRT). This has resulted in variations in healthcare delivery that might affect patient outcomes.[9]

The paediatric RRT (PRRT) is a newly established service at King Abdullah Specialist Children's Hospital. It is a physician-led multidisciplinary paediatric critical care team that assesses and manages patients demonstrating early signs of deterioration in clinical status outside the PICU. It comprises a physician, nurse and respiratory therapist who provide 24/7 services to all in-patient units. PRRT provides two types of services: response to activation events and follow-up service. The follow-up service is provided for patients postactivation events and post-PICU discharge.

Pre-PICU discharge
• PRRT discharge follow-up will be documented on PICU discharge summary note containing the following elements: ➢ Expected time of the first visit ➢ Visit frequency ➢ Team-led or nurse-led ➢ Aim of visits
PRRT pre-visit
• Cases will be reviewed by all team members twice a day (morning and afternoon)
PRRT nurse-led visit
• PRRT nurse will do the following: ➢ Assess the patient's clinical status ➢ Complete the PRRT follow-up form in the electronic medical record (EMR) ➢ Initiate/Recommend a plan for the patient ➢ Escalate urgent concerns immediately to the PRRT covering physician
Post visits
• All the follow-up visits will be discussed with the PRRT covering physician immediately after completing the round • Non-urgent recommendations will have to be discussed and communicated to the primary team through the PRRT physician • PRRT-physician must co-sign the PRRT follow-up form

Figure 1 Flow of care: nurse-led follow-up for post-PICU discharge. PICU, paediatric intensive care unit.

Approximately 90 nurses are assigned to PICU units; these nurses are paediatric advance life support certified and can manage critically ill patients. The administrative nursing body selected 15 PRRT nurses based on their clinical experience and bedside care performance. They attended a 2-day specialised training programme before joining the PRRT as a team member. PRRT nurses were trained through classroom lectures focusing on early signs of clinical deterioration, nursing management and the escalation process. In addition, the training contained several activities, such as case scenarios, group discussion and problem-solving, followed by a simulation activity in which each nurse participated as the first responder. PRRT nurses are rotated in the service coverage in both day and night duties, but they still perform PICU duties.

A series of Plan–Do–Study–Act cycles (PDSAs) were carried out to further improve service structure and process. One PDSA cycle was carried out to address the delay in initiating follow-up visits due to physicians' shortage and their engagement in covering several other units apart from their PRRT duty. A baseline data set revealed that across a 3-month period, the average monthly delays were 12 days. This issue disturbs the timely assessment process, and missed patient deterioration is a concern.

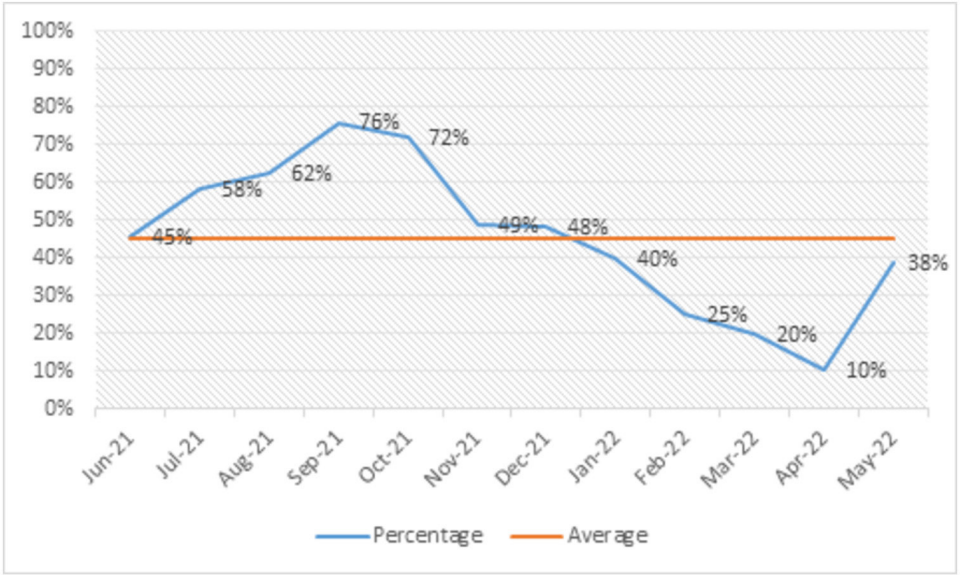

Figure 2 Percentage of nurse-led service visits.

To the best of our knowledge, no study in Saudi Arabia has implemented a nurse-led service for patients newly discharged from the PICU. However, the PRRT adopted a nurse-led follow-up service from the critical care outreach programme, published in 2019.[7]

This study aimed to achieve no delays in the initiation of follow-up visits and to assess the safety of implementing a nurse-led follow-up service.

Project context

This study was conducted at King Abdullah Specialist Children's Hospital, which is an academic tertiary care centre in Riyadh, Kingdom of Saudi Arabia. The hospital has approximately 220 paediatric beds and approximately 8000 admissions yearly. The hospital has 14 inpatient units, including 2 high-dependency units and 2 PICUs (1 medical and 1 trauma and surgical). The hospital is part of the Ministry of the National Guard Health Affairs System composed of five tertiary hospitals. The nursing staff of this hospital are a multinational diverse workforce, and most of them have diplomas and are graduates with at least a bachelor degree.

The PRRT committee was established to set up the administrative and clinical requirements of the PRRT service before its implementation. It comprises a PICU consultant, a PICU fellow, a director of nursing, a nurse specialist and a respiratory therapy supervisor. Weekly meetings were conducted to develop policy, procedure, training and implementation plans. These meetings are spaced into monthly meetings to monitor service progress, troubleshoot issues and revise service standards when needed.

Key performance indicators were monitored, and reports were generated and shared with the PRRT committee, nursing services and the PICU quality steering committee.

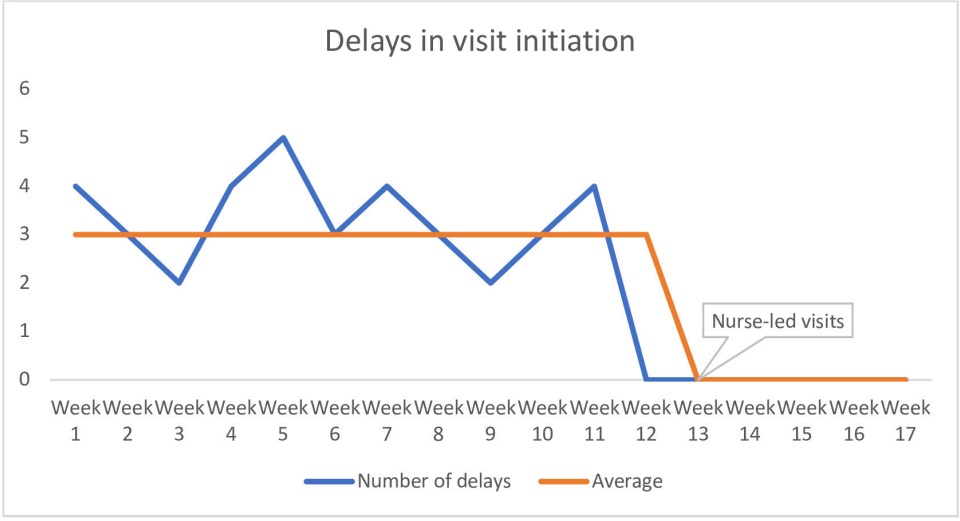

Figure 3 Delays in visit initiation.

Improvement method

We defined delay as the initiation of follow-up visits after 10:00 hours. The PDSA cycle methodology was used for service improvement. The (Plan) phase involved conducting literature reviews to look at potential solutions and defining the aim to begin follow-up visits as soon as feasible, which was between 8:00 and 10:00 hours in the morning. The nurse-led follow-up service for post PICU discharges was designed and put into place at the (Do) stage. Service safety indicators were tracked during the (Study) phase and, ensured that visits were starting on time. At the end, the (Act) phase involved updating departmental policy and procedure documents to change the flow of care inside PRRT.

The tasks and responsibilities of PRRT nurses had to shift as a result of this transformation. To ensure workflow consistency, PRRT nurses were provided with post-PICU discharge follow-up guideline (figure 1).

The PRRT shift starts with a PRRT nurse and physician screening all patients under their service to determine whether the required nurse-led visit team members include a nurse or a nurse with a respiratory therapist. Nurse-led visits are conducted immediately after the screening. A systematic patient assessment, medication review, primary team plan, recent laboratory test review and discharge plan are performed. The PRRT nurse will complete a designated form in the electronic patient record with the assessment, findings and recommendations. After completing all patient visits, the team will conduct a huddle to discuss the patient's plans and communicate these through the electronic patient records to the primary team. If deterioration requiring medical intervention is detected during a nurse-led visit, immediate escalation to the PRRT physician is commenced, followed by their assessment and review of the case. Urgent interventions are communicated to the patient's primary team. If the PRRT covering physician is attending to another case at the time of escalation, they will delegate the escalation to another senior physician. Finally, the PRRT nurse on duty is responsible for completing the follow-up elements in the service database.

A Microsoft Excel sheet was created to track delays in the initiation of follow-up visits. The follow-up database of RRT was reviewed during handovers to ensure the completion of all elements. Safety measures were monitored on a monthly basis and a report was generated and shared with the PRRT committee, nursing services and PICU quality steering committee.

This initiative was a result of proactive intervention to resolve manpower shortages and to prevent patient harm. Reported delays in visit initiation were recorded with an average of 12 delays per month from March 2021 to May 2021. There was no baseline information on harmful events that may have occurred due to delayed follow-up visits by a team-led service because PRRT is a newly launched service. The absence of a service database during the implementation phases created a challenge in comparing patient outcomes before and after the intervention.

The percentage of nurse-led visits was monitored to measure the demand for the service (figure 2) There are four safety measures obtained from the follow-up database. The first measure is the activation of the PRRT during the nurse-led follow-up service. The second measure is the PRRT activation events within 48 hours of the patient signing off for the nurse-led follow-up service. The third measure is the readmission rate to PICU (obtained by the number of readmitted patients to PICU within 48 hours divided by the number of patients discharged from the PICU multiplied by 100). The fourth measure is cardiopulmonary arrest events for patients newly discharged from the PICU during the service coverage and within 48 hours from signing off the patients.

These measures reflect the level of safety for paediatric patients who received nurse-led follow-up service.

Readmitted patients to PICU were monitored for the following elements: length of stay in days, clinical deterioration within 24 hours from readmission time indicated by non-invasive ventilation, endotracheal intubation or the initiation of inotropic medication. The last indicator is cardiopulmonary arrest during the readmission stay.

Two PRRT nurses who were validated data collectors for the PRRT database extracted data into a spreadsheet. After that, the PRRT nurse specialist reviewed and cleaned the data. The data included in the study are for patients who received a nurse-led follow-up service post-PICU discharge. We excluded patients who received a team-led follow-up or mixed visits (team led and nurse led) on different days.

RRT nurses were provided with data collection methodology documentation, followed by an individual validation session conducted by a PRRT nurse specialist.

The retrospective data collection occurred between June 2021 and May 2022.

RESULTS

Over 12 months, 1051 patients were discharged from the PICU to the high-dependency, subspecialised and general paediatric units. Four hundred and eighty-seven patients were under a nurse-led follow-up service, accounting for 45% of all discharges from the PICU. On discharge from the PICU, 9% of nurse-led follow-up patients were identified as high-risk patients by the PICU team, and overnight visits were requested in the discharge summary note.

The team achieved zero reported delays on visit initiation from June 2021 and this result was sustained (figure 3)

Frequencies of visits per patient ranged between 1 and 4, as demonstrated in table 1, and mentioned here as follows: 1 visit 78% (n=381), 2 visits 17% (n=82), 3 visits 4% (n=19) and 4 visits 1% (n=5).

Safety measures are demonstrated in table 2, mentioned here as follows: 0.20% (n=1) recorded events of RRT activations during the follow-up service; PRRT activation

Table 1 Visit frequencies per patient

Visits	Frequency	Valid per cent	Cumulative per cent
1 visit	381	78	78
2 visits	82	17	95
3 visits	19	4	99
4 visits	5	1	100
	487	100	

within 48 hours from service discharge was 1.20% (n=6), and readmission to PICU within 48 hours was 0.80% (n=4). Patients who experienced readmission to PICU were only four cases. Two cases had clinical deterioration within 24 hours from PICU readmission, which were under the non-invasive ventilation category. No cardiopulmonary arrest event was recorded and, the average length of stay was 4.75 days for all cases.

The average percentage of patients who received nurse-led follow-up service was 45%.

The majority of the patients required one follow-up visit. Only four cases required readmission to PICU, where the PRRT nurse promptly identified clinical deterioration during the first or second follow-up visit. No significant deterioration occurred outside the PICU that led to cardiopulmonary arrest during the service, postservice discharge or postreadmission to PICU.

There was no clear documentation of when deterioration was detected during a nurse-led visit. Therefore, it was upgraded to team led as all emergency escalations were telephonic, followed by immediate physician assessment. The presence of a paediatric physician for RRT orientation created inconsistency in conducting a nurse-led follow-up visit as they join visits for training purposes; nevertheless, assessment, documentation and decision-making are the RRT nurse's responsibility. Therefore, these visits in the database were counted as team-led visits.

There are 3 months of missing data as the PRRT database was not established at the beginning of the service launch. It took 3 months to train the PRRT nurses to collect the data and complete their validation process.

The demand for the nurse-led service was higher during the first 6 months of the implementation and decreased towards the end. This was caused by introducing a medical residency training programme and modifying the physician team leader.

DISCUSSION

This study aimed to achieve zero delays in visit initiation and to assess the safety of implementing a nurse-led follow-up service on patient outcomes. We focused on four safety measures: activation events of the PRRT during the nurse-led follow-up service, activation events of the PRRT within 48 hours from the signing-off patients to the nurse-led follow-up service, readmission rate to PICU and cardiopulmonary arrests. Forty-five per cent received the service. The readmission rate was 0.8% (n=4), with no cardiopulmonary arrest events. This study contributes to the paediatric population as there are limited studies available, and this is the first reported nurse-led follow-up service post-ICU discharge in Saudi Arabia.

A reduction in the readmission rate to PICU was reported in several studies,[7 10] while other studies reported that the readmission rate remained the same.[11] It was observed that the readmission rate remained the same with the implementation of the service which was between 0% and 2.5%. Looking at the nurse-led follow-up patients only, the low readmission rate can be related to the clinical stability of these cases compared with the cases that received a team-led follow-up.

Assigning stable patients to a nurse-led service in our study was due to the limited scope of practice of nurses that restricts the types of intervention they can provide during the visits. Most of the interventions are non-technical skills such as assessment, education and escalation. Nurses were not privileged to perform technical duties like medication administration or ordering investigations without a physician's orders. This limitation is due to the absence of a national nursing scope of practice.[12]

Nurse-led follow-up post-PICU discharge studies investigated the impact of similar services on hospital mortality. Some studies found a reduction in hospital mortality,[8] while mortality was not affected in other studies.[10] The overall hospital mortality decreased by 22% comparing preimplementation with postimplementation but we cannot comment on that reduction as they are multiple projects, such as the paediatric early warning system,

Table 2 Safety measures

	Safety measures					
	Yes	f (%)	No	f (%)	N	f (%)
Activation during PRRT services	1	0.20	486	99.80	487	100
Activation within 48 hours from sign-off	6	1.20	481	98.80	487	100
Readmission to PICU within 48 hours	4	0.80	483	99.2	487	100
Cardiopulmonary arrest	0	0	487	100	487	100

PICU, paediatric intensive care unit; PRRT, paediatric rapid response team.

code blue team and the PRRT, which may directly affect mortality.

Implementing a nurse-led follow-up service with an autonomic role to independently perform visits post-PICU discharge saves the time required for nurses waiting for a physician to accompany them. Furthermore, it saves physicians' time, allowing them to attend to other daily activities and acutely ill patients. This service is considered a non-technical intervention as the nurses' main responsibilities during the visits are assessment, recommendation and escalation, which are performed in other studies.[13]

Limitations

This study has some limitations. First, the study sample size was too small to generalise the outcomes, given that this report is based on only 1 year of experience. Second, cost-effectiveness was not explored due to different pay scales among nurses.

CONCLUSION

The nurse-led follow-up service has shown to be a safe and efficient service provided in a timely manner. RRT nurses were not engaged with PICU activities during their duty to secure sufficient time to perform nurse-led follow-up duties and ensure service sustainability. This model will be adopted by other Ministry of National Guard Hospitals. In the future, a comparison study can explore patient outcomes in nurse-led versus team-led follow-ups. In addition, creating nurse-led designated documentation in EMR will be useful and will reflect the demand of the service more accurately.

Acknowledgements The author would like to acknowledge all PRRT nurses for their commitment and Editage (www.editage.com) for English language editing.

Contributors Study conception and design: RAA. Programme approval: RAA, IM and JE. Analysis and data interpretation: RAA and MA. Drafting of the manuscript: RAA, EK and IM. Critical revision: by all authors: IM, JE, MA, EK, SD and MA. RAA is responsible for the overall study content as the guarantor.

Funding The authors have not declared a specific grant for this research from any funding agency in the public, commercial or not-for-profit sectors.

Competing interests None declared.

Patient and public involvement Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

Patient consent for publication Not applicable.

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement Data are available on reasonable request.

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