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Intra-hospital Registered Nurse (RN) Transport Teams Impact on Patient Safety

In pediatric patients, does intra-hospital transport by a designated RN transport team, versus transport by the bedside nurse, result in fewer unexpected events during transport and fewer adverse events for patients on the units?

Clinical Question

| | |
|------------------------|--|
| P (population/problem) | In pediatric patients |
| I (intervention) | Intra-hospital transport by designated RN transport team |
| C (comparison) | Intra-hospital transport by bedside RN |
| O (outcome) | Fewer unexpected events during transport and fewer adverse events for patients on the units? |

Definitions:

RN Transport Team – in-house RN designated to transport inpatients to radiological procedures

Severe Compromise – patient events that include extubation, cerebro-vascular accident, cardiac arrest, emergent surgical intervention, new arrhythmia, mental status changes and death

Moderate Compromise – hypothermia, 20% change in heart rate, respiratory rate or blood pressure and SAO₂ decrease below 90%

Technical Mishaps – disconnected monitor leads, low battery, ventilator failure and various line tangles

Target Population

Hospitalized pediatric general care and Intensive Care Unit (ICU) patients

Recommendations

- 1.) There is insufficient data and lack of consensus to direct development of a recommendation regarding a RN intra-hospital transport team serving the ICU population.
- 2.) It is recommended that the current RN intra-hospital transport team serving the general care population be maintained. (*Braman 1987 [4a], Brokalaki 1996 [4b], CCHMC 2008, Doring 1999 [4b], Papsen 2007 [4b], Szem 1995 [3a], Tobias 1996 [4a], Wallen 1995 [4a]*)
- 3.) It is recommended that a pilot RN intra-hospital team serving the ICU population be created and studied to examine the effect on patient outcomes. (*Kane 2007 [1a]*)

Cincinnati Children's Hospital Medical Center policy: I-115 Patient Transportation/Transfer. Last reviewed 3/09/2007. Link: <http://apps/applications/bookmanager/policyviewer/policyappviewreconf.asp?Bookkey=CHCLINIC&Policykey=I-115&BookTitle=Clinical%20Practice%20Policies&Criteria=any&SearchTerms=transport/transport#FirstHit>

Discussion/summary of evidence

The literature search did not provide any direct evidence related to intra-hospital transport by a RN team versus transport by a unit RN. There were no National Association of Children's Hospitals and Related Institutions (NACHRI) responses to the question. Thus there was no direct answer to the PICO question.

Transport Outcomes

Due to the lack of evidence to the specific question which included an intra-hospital transport team, evidence was gathered related to adverse events during intra-hospital transport. Although evidence was found on both adult and pediatrics, the focus of this study remained on pediatrics as it was done at a children's hospital. In relation to the safety of patients during transport, Szem, Hydo, Fischer, Kapur, Klemperer & Barie (1995) [4a] found that 5.9% of adult ICU intra-hospital transports resulted in severe compromise. Severe compromise included extubation, new arrhythmia, cerebrovascular accident, cardiac arrest, mental status changes, emergent surgical intervention or death. However Wallen, Venkataraman, Grosso, Kiene & Orr (1995) [4a] and Papon (2007) [4b] found that moderate compromise occurred more frequently. Wallen et al. (1995) [4a] showed that approximately 66% of PICU patients had some moderate compromise during transport. These moderate compromises included hypothermia (core temp <36) or a 20% change in heart rate, blood pressure or respiratory rate. Papon, Russell & Taylor (2007) [4b] found that in adult emergency room patients needing intra-hospital transport, 67.9% experienced an unexpected event of moderate compromise. These included O₂ saturations below 90%, hypotension <90mm Hg, sedation wearing off, paralysis wearing off or hypertension >200mm Hg. Brokalaki, Brokalakis, Digenis, Baltopoulos, Anthopoulos & Karvountzis (1996) [4b] investigated the use of nasal O₂ therapy in adult general care intra-hospital transports. They found that patients transported to radiology with O₂ on had more stable vital signs. When those same patients were transported back to the unit without O₂, their baseline PO₂ decreased 6% and SaO₂ decreased 8%. When looking at ICU patients, Braman, Dunn, Amico & Millman (1987) [4a] found that in adult ICU intra-hospital transports when patients were manually bagged versus placed on a mechanical ventilator, they showed a significant change in mean PCO₂. Tobias (1996) [4a] also found that in Pediatric Intensive Care Unit (PICU) patients, manual bagging during transport vs. use of a portable ventilator led to ETCO₂ being outside of the normal range in 62% of transports. Finally in regards to technical mishaps during transport, Doring, Kerr, Lovasik & Thayer (1999) [4b] found that technical mishaps occurred in 40% of transports of neuro ICU patients. Papon et al. (2007) [4b] also found that in intra-hospital transports from the emergency department, technical mishaps occurred in 46% of transports.

The grade of this evidence related to the increased occurrence of adverse events and technical mishaps during intra-hospital transport vs. no transport off the unit was moderate.

Staffing Outcomes

Evidence was then investigated related to the outcomes of the patient population on the unit when the unit RN was able to stay on the unit vs. transporting a patient off the unit.

Kane, Shamiliyan, Mueller, Duval & Wilt's (2007) [1a] meta-analysis looked at the relation between RN staffing and patient outcomes. There were 96 studies included in this meta-analysis. One way the studies were analyzed was based on ICU versus general care units. Kane et al. (2007) [1a] found that increased RN staffing of 1 full time equivalent (FTE) per patient day was associated with a 9% reduction odds of death in ICU patients and 6% in medical patients. The study showed that by adding one RN per patient day there was a greater reduction in the relative risk on hospital-related mortality and adverse events in ICU's than general care units. Results also showed that in an ICU an increase of one RN per patient day was associated with decreased hospital acquired pneumonia, unplanned extubation, respiratory failure and cardiac arrest. More specifically in the ICUs, by adding one RN FTE per patient day the odds were 60% lower a patient would have respiratory failure. Also by doing the same, the odds of extubation were 51% less and cardiac arrest was 28% less in ICUs. This may provide indirect evidence, as now when a patient leaves the ICU for a procedure the census decreases one patient but will also decrease one RN. If the RN transporter would take the patient and the ICU RN stay on the unit, the RN staffing would increase by one RN.

The grade of the evidence related to RN staffing ratios and patient outcomes was high.

Summary

In relation to intra-hospital transport, there were several variables in the selected studies. Several patient populations were studied including: adult and pediatric ICU, adult and pediatric general care and surgical units. Every study involved intra-hospital transport, but had varying definitions of measured outcome variables. Outcomes were grouped into categories of severe compromise, moderate compromise and technical difficulty. All studies showed that the occurrence rates of these outcomes were increased during the transport process. Recommendations in these studies

were to have an experienced, dedicated transport team. The process would not only allow for better care of the patient during transport but also allow the ICU RN to stay on the unit and keep staffing high. Kane (2007) [1a] showed that lower patient to RN ratios in the ICU and general care units helped decrease complications and mortality on the unit.

This also supports the CCHMC hospital policy that based on the condition and equipment in use, patients are required to be transported with a RN, RT or MD.

Health Benefits, Side Effects and Risks

| | Some | Minimal | None |
|-----------------|---|--------------------------|-------------------------------------|
| Health Benefits | <input checked="" type="checkbox"/> Decrease in adverse events to patient in the ICUs and general care units. | <input type="checkbox"/> | <input type="checkbox"/> |
| Side Effects | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| Other Risks | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |

References/citations

Events during transport

Braman, S. S., Dunn, S. M., Amico, C. A., & Millman, R. P. (1987). Complications of intrahospital transport in critically ill patients. *Annals of Internal Medicine*, 107(4; 4), 469. [4a]

Brokalaki, H. J., Brokalakis, J. D., Digenis, G. E., Baltopoulos, G., Anthopoulos, L., & Karvountzis, G. (1996). Intrahospital transportation: Monitoring and risks. *Intensive & Critical Care Nursing*, 12(3), 183-186. [4b]

Doring, B. L., Kerr, M. E., Lovasik, D. A., & Thayer, T. (1999). Factors that contribute to complications during intrahospital transport of the critically ill. *Journal of Neuroscience Nursing*, 31(2), 80-86. [4b]

Papson, J. P. N., Russell, K. L., & Taylor, D. M. (2007). Unexpected events during the intrahospital transport of critically ill patients. *Academic Emergency Medicine*, 14(6), 574-577. [4b]

Szem, J. W., Hydo, L. J., Fischer, E., Kapur, S., Klemperer, J., & Barie, P. S. (1995). High-risk intrahospital transport of critically ill patients: Safety and outcome of the necessary "road trip". *Critical Care Medicine*, 23(10), 1660-1666. [3a]

Tobias, J. D., Lynch, A., & Garrett, J. (1996). Alterations of end-tidal carbon dioxide during the intrahospital transport of children. *Pediatric Emergency Care*, 12(4), 249-251. [4a]

Wallen, E., Venkataraman, S. T., Grosso, M. J., Kiene, K., & Orr, R. A. (1995). Intrahospital transport of critically ill pediatric patients. *Critical Care Medicine*, 23(9), 1588-1595. [4a]

References R/T unexpected events during transport – Grade of body of evidence – Moderate

Staffing Related

Kane, R. L., Shamliyan, T. A., Mueller, C., Duval, S., & Wilt, T. J. (2007). The association of registered nurse staffing levels and patient outcomes. systematic review and meta-analysis. *Medical Care*, 45(12), 1195-1204. [1a]

References R/T events due to staffing levels – Grade of body of evidence – [High]

Internal Data

Cincinnati Children’s Hospital Medical Center (2008). *Internal Performance Improvement Data, Radiology Transport Team: Cincinnati, OH*. Generated March 11, 2009. [5a]

Note: Full tables of evidence grading system available in separate document:

- [Table of Evidence Levels of Individual Studies by Domain, Study Design, & Quality](#) (abbreviated table below)
- [Grading a Body of Evidence to Answer a Clinical Question](#)
- [Judging the Strength of a Recommendation](#) (abbreviated table below)

Table of Evidence Levels (see note above)

| <i>Quality level</i> | <i>Definition</i> |
|----------------------|--|
| 1a† or 1b† | Systematic review, meta-analysis, or meta-synthesis of multiple studies |
| 2a or 2b | Best study design for domain |
| 3a or 3b | Fair study design for domain |
| 4a or 4b | Weak study design for domain |
| 5 | Other: General review, expert opinion, case report, consensus report, or guideline |

†a = good quality study; b = lesser quality study

Table of Recommendation Strength (see note above)

| <i>Strength</i> | <i>Definition</i> |
|------------------------|---|
| “Strongly recommended” | There is consensus that benefits clearly outweigh risks and burdens (or visa-versa for negative recommendations). |
| “Recommended” | There is consensus that benefits are closely balanced with risks and burdens. |
| No recommendation made | There is lack of consensus to direct development of a recommendation. |

Dimensions: In determining the strength of a recommendation, the development group makes a considered judgment in a consensus process that incorporates critically appraised evidence, clinical experience, and other dimensions as listed below.

1. Grade of the Body of Evidence (see note above)
2. Safety / Harm
3. Health benefit to patient (*direct benefit*)
4. Burden to patient of adherence to recommendation (*cost, hassle, discomfort, pain, motivation, ability to adhere, time*)
5. Cost-effectiveness to healthcare system (*balance of cost / savings of resources, staff time, and supplies based on published studies or onsite analysis*)
6. Directness (*the extent to which the body of evidence directly answers the clinical question [population/problem, intervention, comparison, outcome]*)
7. Impact on morbidity/mortality or quality of life

Supporting information

Introductory/background information

Working on a Registered Nurse intra-hospital transport team focusing on general care patients for the past four years, the question has often arisen regarding the transport of ICU patients to radiological procedures and the benefits of including the ICU’s within our transport population. There have been various opinions on the benefit of including the ICU within the intra-hospital RN transport team’s area of responsibility. The safety benefits of the general care RN intra-hospital team have been demonstrated by internal data collected over several years, but would these benefits transfer to ICU patients and the units, as their staffing ratio is typically lower?

The hospital’s policy states that patient condition, equipment and medications will dictate what level of care provider is needed during transport. These vary from patient escort, RN, Respiratory Therapist (RT) and Medical Doctor (MD). There are specific medication, conditions and equipment that require RN only, RN and RT or RN, RT, and MD.

Group/team members

B.J. Morgan RN BSN
 Clinical Manager A7N/S
 Radiology Transport RN 2004-2009

Search strategy

1. DATABASES

- OVID MEDLINE
- OVID CINAHL
- OVID EBM Reviews (Cochrane)
- PubMed Clinical Queries
- other (specify)
- NACHRI list-serve

2. SEARCH TERMS

Intra-hospital, transport, pediatric, children, radiology, critical care, staffing, safety, patient outcomes

Known conflicts of interest

None

Applicability issues

The addition of a ICU focused RN intra-hospital transport team would have minimal barriers. At this time all of the members of the general care team are also ICU trained and pediatric advanced life support (PALS) certified. The main challenge would be the addition of another RN FTE to the team. This would be the barrier seen in cost and budgeting.

Copies of this Best Evidence Statement (BEST) are available online and may be distributed by any organization for the global purpose of improving child health outcomes. Website address: <http://www.cincinnatichildrens.org/svc/alpha/h/health-policy/ev-based/default.htm>

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Note

This Best Evidence Statement addresses only key points of care for the target population; it is not intended to be a comprehensive practice guideline. These recommendations result from review of literature and practices current at the time of their formulation. This Best Evidence Statement does not preclude using care modalities proven efficacious in studies published subsequent to the current revision of this document. This document is not intended to impose standards of care preventing selective variances from the recommendations to meet the specific and unique requirements of individual patients. Adherence to this Statement is voluntary. The clinician in light of the individual circumstances presented by the patient must make the ultimate judgment regarding the priority of any specific procedure.

Reviewed by Clinical Effectiveness