Engaging rural clinicians in implementing paediatric emergency medicine research findings

EM Cotterell¹, L Haskell², EJ Tavender³, CL Wilson³, S O’Brien⁴, E Oakley⁵,⁶, SR Dalziel²,⁷, on behalf of PREDICT (Paediatric Research In Emergency Departments International Collaborative)
¹School of Rural Medicine, University of New England, NSW, ²Children’s Emergency Department, Starship Children’s Hospital, New Zealand, ³Department of Emergency Research, Murdoch Children’s Research Institute, Royal Children’s Hospital, Vic, ⁴Princess Margaret Children’s Hospital, WA, ⁵Department of Emergency Medicine, Royal Children’s Hospital, Vic, ⁶Department of Paediatrics, Faculty of Medicine, Dentistry and Health Services, The University of Melbourne, Vic, ⁷Liggins Institute, The University of Auckland, New Zealand

Introduction

The majority of ill or injured children requiring emergency care present outside of the tertiary setting, yet most high quality research such as randomised control trials are conducted in tertiary paediatric emergency departments (EDs). Understanding how to effectively apply research findings to the non-tertiary setting is important in achieving effective equitable health care improvements for all children, regardless of where they present. Knowledge translation (KT) research aims to gain an understanding of why there are practice variations, and then design, implement and evaluate strategies to increase the uptake of research evidence.

PREDICT (Paediatric Research in Emergency Departments International Collaborative) is a peer recognised research network and has contributed substantially to the evidence base in paediatric emergency medicine (PEM) in important clinical areas such as bronchiolitis and head injury.¹,² Bronchiolitis and head injury have been chosen as topics due to their high frequency of presentation to large tertiary EDs as well as small rural or metropolitan EDs. Evidence based clinical guidelines and clinical decision rules provide the basis for best practice for these conditions respectively and PREDICT has been at the forefront of research in these areas.¹,²

Despite the existence of high quality research evidence in PEM, practice variation in clinical management of common and important health conditions is well reported.³ Bronchiolitis is the most common reason for hospital admission in infants less than 12 months⁴ and head injury is among the most common ED presentations for children across the age range, yet even these common presentations have considerable variation in care. For example, the use of medications for management of bronchiolitis has been shown to vary widely across different settings, from 27% to 49% in a study of seven different sites in Australia and New Zealand³ despite good evidence of lack of benefit for these medications. Further, the use of Head Injury Clinical Decision Rules, such as the Pediatric Emergency Care Applied Research Network (PECARN)⁵ and Children’s Head Injury Algorithm for the Prediction of Important Clinical Events (CHALICE)⁶ head injury rules, to determine need for cranial computer tomography (CT) scans in children is also an area of significant practice variation.⁷

There is limited evidence for the most effective methods to translate knowledge into practice in PEM. A systemic review of the literature identified 15 studies of varied design,⁸ including cluster-controlled trials, and interrupted time series and before and after intervention studies. Knowledge translation interventions were predominantly aimed at the treating clinician and changes in clinical practice were variable.
Similarly, studies of KT intervention strategies appropriate to the rural and remote clinical practice setting are limited. The Cochrane Effective Practice and Organisation of Care (EPOC) group undertake systematic reviews of educational and organisational interventions designed to improve health professional practice and the organisation of health care services. Specific interventions tailored to provide professional support to health professionals working in rural and remote areas has been identified as a priority topic area by the Australian satellite EPOC group but this is yet to be addressed.\(^9\)

The PREDICT network is investigating the effectiveness of tailored KT strategies to increase the uptake of research findings in tertiary and non-tertiary ED settings. The KT research follows a systematic, stepped approach as described in the knowledge to action framework.\(^10\) One of the first steps is to adapt new knowledge from research or evidence based guidelines to the local context and this should take into account paediatric expertise, geographic isolation and accessibility to education and equipment. Perceived barriers and enablers to evidence based care will be explored and used to develop tailored KT strategies. The effectiveness of these strategies will be evaluated with a focus on maintaining long-term sustainability.

**Method**

Two research projects will be presented that potentially represent models for engagement of rural clinicians. The primary outcomes of each study are specific clinical measures at sites, reflecting the impact of intervention strategies, however the process of engaging non-tertiary clinicians in KT research is the unifying objective for both studies. The knowledge to action framework\(^10\) components will be employed with emphasis on the action cycle.

**Bronchiolitis KT research**

A cluster randomised control trial (cRCT) will investigate the effectiveness of tailored KT strategies for implementing a universal Australasian acute care guideline, the Australasian Bronchiolitis Guideline.\(^1\) This evidence based guideline for ED and general ward management of bronchiolitis was developed in 2016 using a methodological approach including Grading of Recommendations Assessment, Development and Evaluation (GRADE)\(^11\) and National Health and Medical Research Council (NHMRC) Evaluation of Evidence\(^12\) processes. The guideline development committee consisted of twenty individuals from six Australian states and territories and New Zealand representing tertiary, metropolitan and regional medical and nursing specialists from EDs, general paediatrics and respiratory medicine. The Population Intervention Comparator Outcomes and Time of Interest (PICOt) questions that formed the basis of the systematic literature search were developed by expert consensus. The final document includes a useable clinical interface for bedside use and a descriptive summary of evidence base and evidence tables for each key statement.

The cRCT study design incorporates stratification of tertiary and secondary providers of paediatric care from tertiary children’s hospitals, to metropolitan centres and regional hospitals with general paediatric wards that are referral centres for surrounding rural towns. Site inclusion will be determined by the identification of nursing and medical champions and the capacity to audit medical records. A sample size of 135 per annum ED presentations with a diagnosis of bronchiolitis was predetermined to achieve appropriate statistical power. Site recruitment will occur through established hospital networks in Australia and New Zealand. Sites will be randomised to control or intervention group, with the later group implementing the guideline with supportive educational and behavioural change strategies. Following the 2017 bronchiolitis season, audit data on the use of the five interventions for management of uncomplicated bronchiolitis for which there is high quality evidence of no clinical
benefit (use of chest x-ray; use of salbutamol; use of adrenaline; use of glucocorticoids; use of antibiotics) will be collected retrospectively from both intervention and control sites for 2014 to 2017.

**Head injury KT research**

Australian Paediatric Head Injury Rules Study. PREDICT has recently completed a multicenter observational study of over 20,000 paediatric ED presentations for head injury across Australia and New Zealand. The study examines three existing clinical decision rules for the management of paediatric head injuries (PECARN, CHALICE and Canadian Assessment of Tomography for Childhood Head Injury (CATCH))\(^5,6,13\), when applied to the Australasian population. The main outcome measures were head CT rates and detection of clinically significant intracranial injuries.

An audit of practice variation in cranial CT rates for acute paediatric head injury across 30 EDs will compare regional and rural sites to tertiary sites. This study will also include qualitative telephone interviews to identify information needs of doctors and nurses, to inform the content and methods to deliver KT strategies to improve appropriateness of cranial CTs in children with mild head injuries.

**Results**

**Bronchiolitis trial**

The recruitment of sites for participation in the cRCT for bronchiolitis has been completed, with 26 sites across Australia and New Zealand enrolled, 7 tertiary and 19 secondary sites, of which four are outside major metropolitan centres. Engagement in the recruitment process was high with 10 additional sites, predominantly regional centres, expressing interest but unable to participate due to inadequate numbers of bronchiolitis presentations to their EDs. The relevance of the study to clinical practice in their own settings and the facilitated process to participate in the study, through a site coordinator visit and supportive measures such as “Train the Trainer day” for intervention sites, were appealing to sites that usually have barriers to participation in research. The study required endorsement from both the paediatric department and ED at each site. A few sites were unable to participate due to only one of the departments being engaged.

Parallel to site recruitment, 20 semi-structured interviews were undertaken by investigators with clinicians to explore factors perceived to influence the uptake of five key evidence-based recommendations from the Australasian Bronchiolitis Guideline.\(^1\) Both nurses and medical officers (senior and junior) were interviewed from four hospitals, one regional and one tertiary metropolitan hospital in both Australia and New Zealand, with staff from the paediatric department and ED being interviewed. Sixteen interviews were face-to-face, with four completed by phone. The resulting interviews were transcribed and analysed using NVivo11 (QSR software) into a theoretical domains framework model. An expert panel then developed suggested interventions based on mapping of behaviour change techniques.

The 26 sites have been randomised 1:1 into intervention or control sites. Intervention sites will complete an audit of the management of 40 bronchiolitis patients from 2016. The results of the audit will identify areas for improvement, gain buy-in from sites and enable the process of tailoring interventions to site-specific requirements. Each intervention site will choose four clinical champions to attend a “train-the-trainer” day in February 2017. These champions will be responsible for delivering the study interventions to their staff prior to the 2017 bronchiolitis season.
Cranial Computed Tomography for head injury audit

The project is in the recruitment phase with 31 sites confirmed across Australia and New Zealand (9 tertiary/11 major urban/11 rural/regional). A national ethics application is in progress. All sites will audit 100 head injury presentations. Audit and analysis is planned for completion prior to end 2017. Clinicians will be invited to participate in qualitative interviews after site recruitment has been finalised.

Discussion

The first stages of KT studies in paediatric emergency medicine care in the Australian and New Zealand setting have commenced. Engagement with the clinicians treating children, particularly in non-tertiary settings has been very positive and will help establish a model for implementation of research findings for future PREDICT projects. The model of the cRCT enables a tiered approach to evaluate tailored interventions applicable to different settings.

The main limitation of the process to date has been related to requirement for specific number of cases seen at each hospital for auditing purposes despite the conditions being common. For the bronchiolitis KT cRCT, a minimum sample size of 135 ED presentations with bronchiolitis was required for measurement of compliance with the guideline by assessing the use of five diagnostic or treatment modalities. Many regional centres that had expressed an interest in participation fell well short of this target. The requirement for practice audit of multiple diagnostic and treatment modalities poses challenges when comparing sites that have vastly different numbers of ED presentations, but methodological rigour requires adequate sample size for statistical power to enable differences to be meaningful.

Additional limitations include geographical spread of hospitals within both countries; and challenges for sites gaining local ethics approval without a large amount of prior experience, or local support, and doing so within a limited timeframe. These challenges unfortunately can limit smaller rural hospitals from participation. Although such hospitals could potentially participate in future studies that do not have inclusion criteria stipulating a certain minimum number of patients, barriers around the amount of effort for local ethics approval still remain. The ability of projects such as these to build translation research capacity in the long term in regional and rural centres is yet to be demonstrated.

Conclusion

An understanding of the most effective KT strategies to implement research findings in paediatric emergency care within regional and rural health settings is fundamental to improving the care of all children presenting with acute illness or injury. Design of translational research projects to include rural and regional centres is integral in achieving this.

References


**Presenter**

Elizabeth Cotterell trained in paediatrics and subspecialised in Paediatric Emergency Medicine at Sydney Children’s Hospital, Randwick, taking on a consultant position in 2002. Her role involved teaching and supervision of junior medical staff as well as collaborative research as part of paediatric emergency medicine research network (Paediatric Research in Emergency Departments International Collaborative (PREDICT)). Liz moved with her family to Armidale, northern NSW, in 2010 to undertake a position as Associate Professor at School of Rural Medicine at University of New England and general paediatrician at Armidale Rural Referral Hospital. Her current work involves teaching paediatrics to undergraduate medical students as well as supporting junior medical and nursing staff education. Recent research involves supervision of projects involving paediatric pain management in rural emergency departments and management of developmental dysplasia of hips in rural setting. She is a co-investigator of the NHMRC-funded Centre of Research Excellence in Paediatric Emergency Medicine, with focus on clinical guideline development and knowledge translation research, particularly as applies to the regional and rural setting. Her husband, three children and two beagles love the rural lifestyle, enjoy the lack of traffic and the opportunities for outdoor activities in the distinct seasonal weather of the New England Tablelands.