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Implementation of paediatric pain care-bundle across South-West England clinical network of Emergency Departments and Minor Injury Units: A before and after study

Treadgold, R

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ABSTRACT

Introduction Pain management in children is often poorly executed in Emergency Departments and Minor Injury Units. The aim of this study was to assess the impact of a care bundle comprising targeted education on pain score documentation and provision of appropriately dosed analgesia for the paediatric population attending Emergency Departments (EDs) and Minor Injury Units (MIUs).

Methods A total of 29 centres - 5 EDs and 24 MIUs - participated in an intervention study initiated by Emergency Nurse Practitioners to improve paediatric pain management. In Phase 1, up to 50 consecutive records of children under 18 presenting at each MIU and ED were examined (n=1201 records); Pain Score (PS), age, whether the child was weighed, and provision of analgesia was recorded. A care bundle consisting of an education programme, paediatric dosage chart and flyers, was then introduced across the 29 centres. Nine months following introduction of the care bundle, the same data set was collected from units (Phase 2, n=1090 records).

Results The likelihood of children having a pain score documented increased significantly in Phase 2 (OR 6.90, 95% CI 5.72 to 8.32) , The likelihood of children receiving analgesia also increased (OR1.82, 95% CI 1.51-2.19), although there was no increase in the proportion of children with moderate or severe pain receiving analgesia. More children were weighed following the care bundle (OR 2.58 95%CI 1.86-3.57). Infants and children who were not weighed were more likely to receive an incorrect analgesia dose (p<0.01).

Conclusions Rates of PS documentation improved and there was greater provision of analgesia overall following introduction of the care bundle. Although weighing of children did

improve, the levels remain disappointingly low. EDs generally performed better than MIUs. The results show there were some improvements with this care bundle, but future work is needed to determine why pain management continues to fall below expected standards and how to further improve and sustain the impact of the care bundle.

Keywords:

Pain assessment; Pain management; patient care bundles; emergency service; nurse practitioners; body weight; before and after study; education

1, Introduction

The under-prescription of analgesia for children in pain is well-established (1). The UK National Service Framework (2004) highlighted the right of a child to expect appropriate assessment and management of pain (2). Yet several papers highlight continuing practice deficiencies in emergency departments (3-5),

Barriers to the effective management of pain in children include misconceptions regarding the ability of children to perceive pain (6), a lack of understanding as to how to assess pain across different age groups (7), a fear of over-dosage of analgesia (7), and a concern that analgesia may mask symptoms (8, 9).

Various pain tools have been validated for use in the assessment of pain in the paediatric population (10), but pain remains the forgotten 'fifth vital sign' in triage (11) and is often ignored. Even when an assessment of pain is made, children are often under-treated in comparison to adults (12). Education programmes and protocols have been shown to improve management of pain in children who present to ED (5, 13, 14) although studies have also shown that knowledge and practice related to paediatric pain management can be incongruent (7, 15).

A care bundle can be a useful tool if the aim is to change the underpinning philosophy of practice (in this instance, encouraging clinicians to assess pain in all children who present with unscheduled care needs) without dictating the precise nature of the intervention. (16) This is

important for pain management as the analgesia given in emergency departments and minor injuries units will inevitably reflect variations in patient group directions and prescribing practices. The bundling of interventions together has been shown to be more effective than single interventions (17), particularly where multi-disciplinary teams are involved (18) and the bundle approach is more effective than clinical guidelines (19). The diversity of interventions within a bundle tackles the problem from a variety of different angles, for example, education, audit feedback and new practices.

The South West Peninsula of England has a network of Emergency Nurse Practitioners (ENPs) working in Emergency Departments (EDs) and Minor Injury Units (MIUs) across the region who initiated a drive to improve standards of paediatric pain management. The aim of this project was to assess the impact of a care bundle to improve the quality of pain management, in terms of pain score documentation, and provision of appropriately dosed analgesia, for the paediatric population attending EDs and MIUs across the SW peninsula.

2. Methods

2.1 Design, setting and participants

We conducted a feasibility study using an uncontrolled before and after design. All EDs and MIUs with an ENP across the South West Peninsula (n= 5 and n=24) were eligible to participate. All centres provided emergency care for adults and children. Consecutive clinical records of patients under the age of 18 years of age presenting for care were retrospectively examined by ENPs or Nurse Consultants, who were not involved in direct clinical care. Clinical records were reviewed for the month of December with the aim of reviewing 50 sequential records per centre. Some of the MIUs had fewer than 50 children present in a month; this is reflected in the total sample for each phase. Age, documented pain score (PS), analgesia given,

and documented weights were recorded. All centres (EDs and MIUs) used pain scoring instruments to assess pain in some children; the most frequently used were: Wong Baker, VAS, FLACC or the pain ladder. Choice of instrument was not standardised across centres. Pain assessment was completed by a combination of nurses, parents and, for verbal children, by self-report. The paediatric pain management service in each centre was developed and reviewed by the ENP; management of pain for the individual child was provided by ENPs in the MIUs and by Registered Nurses of varying ranks in the EDs.

2.2 Intervention

The aim of the care bundle was to prompt clinicians to assess, manage and re-assess pain in all children who attend ED or MIU. When using care bundles emphasis is placed on technical change – a different product and/or process – and adaptive change – a change in behaviour (20). Hence we held several meetings with the centres to discuss the contents of the bundle prior to implementation, to ensure that the bundle components would 'work' in each department/unit.

Following analysis of Phase 1 data, a summary of results, including the centre's own ranking compared to other centres, was fed back to staff. An independently funded, trained educator was employed to deliver a care-bundle across all centres over a three month period, consisting of a one hour training session for Registered Nurses, supported by pain assessment and pain management resources. This included a standardised presentation dispelling commonly held misconceptions about pain perception in children, emphasising the need for a structured assessment of pain in children and highlighting the importance of providing children with adequate analgesia. Time for free discussion, and an opportunity for 'questions and answers', was available. A suggested tool to aid in the assessment of pain, and a dose-banding chart to simplify the prescription of analgesics were made available, although uptake of these was at the

discretion of individual units and subject to local governance procedures. The Dose Banding Chart is supplied as Electronic Supplementary Material (Supplementary File 1). Patient Group Directions (PGDs) were used across the MIUs; these were similar on content but not identical, reflecting local service provision. During implementation of the care bundle staff were requested (and reminded) to document any local constraints, such as medical or nurse staffing, that may have impacted on implementation of the bundle.

Nine months after introduction of the care bundle was complete, Nurse Consultants and ENPs collected the same retrospective data set from a further 50 consecutive clinical records of children under 18 years of age presenting to their units. Data collection again took place during the month of December. The study was conducted between 2010 and 2012.

The project was considered by all Trusts to meet the description of service improvement hence, in line with NIHR advice at the time, ethics committee approval was not sought.

2.3 Statistical methods

Results were collated and analysed using descriptive statistics; Odds Ratios, with 95% confidence intervals were used to examine differences and cross-tabulations, using Chi Square and Fishers Exact as appropriate. Two analyses were conducted: (i) overall comparison between aggregated records pre and post the intervention (Phase 1 and Phase 2) and (ii) sub-group analysis of data from MIUs and EDs. Analgesia dosing was analysed against recommended doses using the British National Formulary. If the child had been weighed, we calculated the dose range as +/- 10% of the dose calculated for weight; if the child had not been weighed we calculated the dose range as +/- 10% of the dose calculated for age. All data analysis was undertaken using SPSS (version 21).

3. Results

In Phase 1, 1201 cases were included, 245 from five EDs and 956 from 24 MIUs. In Phase 2, there were 1090 cases, 247 from the same five EDs, and 843 from 20 MIUs. Some MIUs had fewer than 50 children attend during the months of data collection. The mean age in Phase 1 was 8.4 years [SD 5.13]; with ED mean age, 7.96 [SD 4.97] and MIU mean age 8.34 [SD 5.16]. In Phase 2 the mean age was 8.18 years [SD 4.93], with ED mean age 8.41 years [SD 5.16] and MIU mean age 8.11 years [SD 4.86]. Age profiles and attendance category were similar across both phases (see table 1). No constraints on bundle implementation were identified at any of the 29 centres.

INSERT TABLE 1

Types of pain scoring instrument used by site and study phase are presented at table 1. In Phase 2, the likelihood of children having a pain score documented increased six fold (OR 6.901, 95% CI 5.72-8.32). Twenty of the 25 centres (MIUs and EDs) participating in both phases of data collection improved their PS documentation rates, although there was variation between centres. All five EDs improved (OR 26.97, 95% CI 15.8-45.9). Fifteen of the 20 MIUs improved and overall rates in MIUs improved (OR 5.361 95% CI 4.35-6.60). In Phase 1, rates of PS documentation in EDs and MIUs were comparable (22.0% vs 19.9%). Following the intervention (Phase 2), EDs significantly out-performed MIUs (90.7% vs 55.9%, $p<0.01$) (see table 2).

INSERT TABLE 2

In Phase 2, children were more likely to receive analgesia (OR 1.82, 95% CI 1.51-2.19) EDs showed the greatest increase (OR 2.28 95% CI 1.75-3.80), compared to MIUs (OR 1.53, 95% CI 1.24-1.90) . EDs gave more significantly analgesia than MIUs in both phases, ($p<0.05$ Phase 1 and $p<0.01$ Phase 2, see table 2) and there was variation in analgesia administration between MIUs.

The proportion of children with a pain score documented as moderate to severe pain (4 or more) that received analgesia remained around 60% in both phases but was slightly higher (Phase 1 62%, Phase 2 66%) for those with severe pain (PS 7-10). EDs gave slightly more

analgesia to this group of patients than MIUs, although this difference was not statistically significant. When analgesia was given, it was initiated by the nurses and mostly occurred within 5-10 minutes of the pain score being recorded. Re-assessment of pain was not routinely recorded in either phase; in total 36 children (1.6%) across both phases of data collection had documentation of pain re-assessment. If stronger analgesia was required, ENPs in the MIUs could administer according to the PGD. In the ED, pain management would be escalated to the physician. In Phase 2, children were more likely to be weighed (OR 2.58, 95% CI 1.86-3.57). Overall, the proportion of children receiving analgesia who were weighed showed little change between the phases (43.2% to 49.7%). In Phase 2in MIUs, this proportion increased from 20.6% to 54.2% ($p<0.01$), approximating the levels seen in EDs.

In MIUs which recorded weight for any patients, weighing was almost exclusively associated with the provision of analgesia, with only two patients (0.5%), one from each phase, being weighed and not receiving analgesia. Many more children not receiving analgesia were weighed in EDs, with a small, non-significant increase (12.7% to 18%) following the introduction of the care-bundle.

Phase 1 analgesia dosing was insufficiently robust for analysis. In Phase 2, after 68 exclusions, 328 separate doses of analgesia were analysed. Overall, 31.4% (103/328) doses were for children who had been weighed. Doses beyond +/- 10% of British National Formulary (BNF) recommended dose were more common in un-weighed (40%, 90/225) than weighed children (35.9%, 37/103) and more common in MIUs (41%, 91/222) than EDs (34%, 36/106). Doses beyond +/- 30% of recommended BNF dose were significantly more common in un-weighed (32.4%, 73/225) than weighed children (9.7%, 10/103, $p<0.01$).

4. Discussion

We reviewed the records of 1201 children in Phase 1 and 1090 children in Phase 2. Our data generated three important findings: first, the care bundle intervention improved pain assessment and management; second, the extent of improvements varied significantly between EDs and MIUs, and, third, less than half of the children who received analgesia had weight recorded, both before and after the care bundle intervention.

The perception amongst ENPs prior to the onset of this intervention was that paediatric pain was poorly managed, and it was the staff themselves who requested help improving their practice. The Phase 1 data supported this notion, demonstrating low levels of pain score documentation and weighing across all centres. Following the care bundle intervention, pain score and weighing rates, and analgesia provision had all improved. This may represent both a heightened awareness that children's pain needs treating, and also the trigger to consider analgesia being prompted by completion of a pain assessment. Previous intervention studies, using similar combinations of intervention components, have revealed conflicting results: a study in Australia (n=242) reported clinically but not statistically significant improvements in pain score documentation, administration of analgesia and time to analgesia (5). A study conducted in a paediatric ED (n=211) resulted in improvements in time to medication, children in pain receiving analgesia and reassessment of pain (13) whilst a further study (n= 794) generated significant reductions in children's memory of pain but did not have any impact on parent or patient reported pain on discharge from the ED (4).

Phase 1 results were similar in EDs and MIUs but, despite receiving the same care bundle intervention, EDs generally showed far greater improvement. It is worth noting that these aggregate scores mask the considerable inter-MIU variation in practice, with some MIUs completing a PS for all paediatric patients. In their systematic review of interventions to improve pain management in ED, Sampson and colleagues concluded that we need to understand more

about the context in which pain management interventions work (21). Our data showed differences in the impact of the intervention between EDs and MIUs, suggesting that differences between these types of settings warrant further investigation. There may be organisational factors, such as availability of support from primary care, that impact on pain management for children in MIUs.

When a PS was documented, the number of those with moderate or severe pain receiving analgesia did not significantly vary with either phase of data collection, or type of unit. The increase in provision of analgesia (irrespective of PS documentation) varied widely between individual centres, but generally, EDs gave more children analgesia than MIUs. This may reflect a difference in patient populations, or represent a greater acceptance amongst staff in EDs for the need for analgesia in children.

There was a small but clinically disappointing improvement in the proportion of children being weighed. Rates of weighing showed dramatic inter-unit variability, but on average, the EDs weighed considerably more children than the MIUs. Although the overall rate remained at around 20% following intervention, this reflects the greater contribution made by MIUs to the data set, and considerable variation in practice remains between units. Inconsistency in weighing of children in ED has been reported in previous studies (22, 23) hence this was not an unexpected finding. This is a grey area in standards for emergency care; the UK Standards for Children and Young People in Emergency Settings (24) state that ED and emergency care settings should have weighing scales and drug dosages are provided in mg/kg but the Best Practice Guideline (25) does not state that all children should be weighed.

In MIUs, weighing was almost exclusively associated with the provision of analgesia. Although considerable variation persisted, weighing without analgesia improved in EDs following the care

bundle intervention. Although many units may choose to use age-dependent dosing, weighing children is important for the accurate prescription of drugs including analgesics, antibiotics and fluids. EDs are more likely than MIUs to have children presenting with conditions requiring weight-modifiable treatment. It is disappointing to note that informal feedback during the conduct of this project suggested that weighing was not performed in some units due to an absence of scales.

4.1 Limitations

Generally, EDs out-performed MIUs in the areas of pain management assessed in this project. These units are scattered across the whole of the SW Peninsula, and cover both rural and more population-dense areas. It is perhaps unhelpful to try to draw too many conclusions from the differences between these groups given both the small number of units involved, the considerable variation in available facilities, staffing, population served, and geographical location and governance. However, it is likely that EDs will receive children with more serious, and potentially more painful, conditions than those presenting to MIUs. As such the benefits of using a structured method for the assessment and subsequent management of paediatric pain may be perceived by the staff as greater. Additionally, the higher volume of cases passing through EDs is likely to have allowed staff to gain experience with this new structured approach to the management of pain, increasing familiarity and uptake. There may also have been a significant degree of pressure to improve performance from senior nurses and doctors in the EDs, which it was beyond the scope of this project to investigate. Data collection for Phase 2 took place 9 months after the introduction of the care bundle; it is not known whether the same effect would have been seen over a longer period.

5. Conclusions

Echoing the findings of previous studies, the delivery of a pain management focussed care bundle has improved paediatric pain management across the SW clinical network. Given the differences in the results between MIUs and EDs, and indeed the variation in pain management across centres, it may be time to rethink a 'one style fits all' approach to education programmes to instigate change. Indeed this is the ethos underpinning a care bundle approach. These results provide evidence of proof of concept but emphasise the need for a larger scale study, taking account of the limitations identified by exploring in more detail how to improve care through uptake of a pain bundle across a broader range of settings. In particular the factors influencing analgesia delivery for those with moderate or severe pain should be examined and the care bundle adjusted accordingly. The results from this study can inform sample size for future studies.

Contributors

DB, SC and RE conceived and designed the study. RT, PS and SC analysed the data. RT, DB, SC, PS and RE interpreted the data. RT and RE drafted the manuscript. All authors critically revised the manuscript and approved the final version.

References

1. Kozlowski LJ, Kost-Byerly S, Colantuoni E, et al. Pain prevalence, intensity, assessment and management in a hospitalized pediatric population. Pain Management Nursing. 2014;15(1):22-35.

2. Department of Health. National service framework: children, young people and maternity services. Department of Health, London, 2004.

3. Kellogg KM, Fairbanks RJ, O'Connor AB et al. Association of pain score documentation and analgesic use in a pediatric emergency department. Pediatr Emerg Care 2012;28:1287-1292.

4. Crocker PJ, Higginbotham E, King BT, Taylor D, Milling TJ. Comprehensive pain management protocol reduces children's memory of pain at discharge from the pediatric ED. Am J Emerg Med 2012;30(6): 861-871.

5. Scott LE, Crilly J, Chaboyer W, Jessup M. Paediatric pain assessment and management in the emergency setting: The impact of a paediatric pain bundle. Int Emerg Nurs 2013;21:173-179.

6. Young L, Kemper KJ. Integrative care for pediatric patients with pain. J Altern Complement Med 2012;19(7):627-632.
7. Twycross A, Collins S. Nurses views about the barriers and facilitators to effective management of pediatric pain. Pain Manag Nurs 2013;14(4): e164-e172 .
8. Walsh B, Cone DC, Meyer EM, Larkin GL. Paramedic attitudes regarding prehospital analgesia. Prehosp Emerg Care 2013;17(1):78-87.
9. Alexander J, Manno M. Underuse of analgesia in very young pediatric patients with isolated painful injuries. Ann Emerg Med. 2003;41:617–622.
10. Franck S, Bruce EA. Putting pain assessment into practice: why is it so painful? Pain Res Manag 2009; 14: 13-20
11. Melby V, McBride C, McAfee A. Acute pain relief in children: use of rating scales and analgesia. Emergency Nurse. 2011;19(6):32-7.
12. Karreman E, Krause CS, Smith S. Children receive less analgesia in general ERs than adults: A retrospective study. Journal of Emergency Medicine, Trauma and Acute Care. 2016;1(1).
13. Corwin DJ, Kessler DO, Auerbach M et al. An intervention to improve pain management in the pediatric emergency department. Ped Emerg Care 2012;28:524-528
14. Williams S, Holzhauser K, Bonney D. et al. Improving pain management of abdominal pain in children presenting to the paediatric emergency department: A pre–post interventional study. Australas Emerg Nurs J 2012;15(3):133-147.
15. Twyford A. What is the impact of theoretical knowledge on children's nurses' post-operative pain management practices? An exploratory study. Nurs Educ Today 2007;27(7):697–707.
16. Resar R, Griffin F, Haraden C, Nolan T. Using care bundles to improve health care quality. IHI innovation series white paper Cambridge. Massachusetts: Institute for Healthcare Improvement; 2012

17. Cooke FJ, Holmes AH. The missing care bundle: antibiotic prescribing in hospitals. *Int J Microb Agents* 2007; 30:25-9
18. Collef M. SMART approaches for reducing nosocomial infections in the ICU. *CHEST* 2008; 134:447-56
19. Robb E. Using care bundles to reduce in-hospital mortality: quantitative survey. BMJ 2010;340:c1234.
20. Pronovost P, Needham D, Berenholtz S, Sinopoli D, Chu H, Cosgrove S, et al. An Intervention to Decrease Catheter- Related Bloodstream Infections in the ICU. N Engl J Med 2006;355(26):2725—32.
21. Sampson FC, Goodacre SW, O'Cathain A. Interventions to improve the management of pain in emergency departments: systematic review and narrative synthesis. Emerg Med J 2014;31(e1):e9-e18.
22. Barrios EK, Hageman J, Lyons E. et al. Current variability of clinical practice management of pediatric diabetic ketoacidosis in Illinois pediatric emergency departments. Ped Emerg Care 2012;28(12):1307-1313.
23. Shaw KN, Lillis KA, Ruddy R M. et al. Reported medication events in a paediatric emergency research network: sharing to improve patient safety. Emerg Med J 2013;30(10):815-819.
24. Royal College of Paediatrics and Child Health. Standards for Children and Young people in Emergency Care Settings. 2012.
25. Royal College of Emergency Medicine: Management of pain in children. Best Practice Guideline 2017; 1-11.

Table 1 Age, attendance category and pain scoring instruments by type of department and study phase.

	MIU				ED			
	Phase 1 (n=956)		Phase 2 (n=843)		Phase 1 (n=245)		Phase 2 (n=247)	
	n	%	n	%	n	%	n	%
Age (yrs)								
<1	42	4.39	25	2.95	9	3.6	7	2.83
1-3	224	23.43	157	18.62	59	24.08	53	21.46
4-7	141	14.75	191	22.66	38	15.51	45	18.21
8-12	272	28.45	273	32.38	74	30.20	74	29.96
>12	277	28.97	204	24.20	65	26.53	69	27.93
Attendance category[1]								
Major injury	13	1.36	23	2.73	20	8.16	24	9.72
Major illness	18	1.88	16	1.89	8	3.26	5	2.02
Minor illness	248	25.94	219	25.98	53	21.63	62	25.10
Minor limb injury	426	44.56	385	45.67	136	55.51	127	51.42
Minor facial injury	74	7.74	66	7.83	19	7.75	15	6.07
Minor head injury	163	17.05	127	15.06	6	2.46	10	4.05
Torso injury	14	1.46	7	0.83	3	1.22	4	1.62
TOTAL	**956**	**100**	**843**	**100**	**245**	**100**	**247**	**100**
Pain scoring instruments								
Wong Baker FACES	109	57.37	217	46.2	34	62.96	48	21.4
VAS/Numeric rating scale	36	18.95	163	34.7	19	35.18	84	37.5
FLACC	0	0.0	45	9.6	1	1.86	13	5.8
Pain ladder	0	0.0	0	0.0	0	0.0	61	27.2
Local tool	45	23.68	0	0.0	0	0.0	16	7.1
Adult tool	0	0.0	3	0.6	0	0.0	0	0.0
unknown	0	0.0	42	8.9	0	0.0	2	2.0
TOTALS	**190**	**100**	**470**	**100**	**54**	**100**	**224**	**100**

1. See Supplementary File 2

Table 2 Documentation of pain score, analgesia administered and children weighed by ED and MIU in Phases 1 and 2

Children with pain score documented			
	Phase 1 (n = 1201) ED n=245 MIU n=956	Phase 2 (n=1090) ED n=247 MIU n=843	OR 95% CI
Overall	244 (20.3%)	695 (63.8%)	OR 6.901, 95% CI 5.72-8.32
ED	54 (22.0%)	224 (90.7%)	OR 26.97, 95% CI 15.8-45.9
MIU	190 (19.9%)	471 (55.9%)	OR 5.361 95% CI 4.35-6.60
Children receiving analgesia			
Overall	234 (19.5%)	294 (27.0%)	OR 1.82, 95% CI 1.51-2.19
ED	60(24.5%)	97 (39.3%)	OR 2.28 95% CI 1.75-3.80
MIU	174 (18.2%)	197 (23.4%)	OR 1.53, 95% CI 1.24-1.90
Number of children weighed			
Overall	57 (4.8%)	124 (11.4%)	OR 2.58 95% CI 1.86-3.57
ED	49 (20%)	71 (28.7%)	OR 1.21 95% CI 0.791-1.851
MIU	8 (0.8%)	53 (6.3%)	OR 8.36 95% CI 3.95-17.69