

Comparison views to diagnose elbow injuries in children: a survey of Canadian non-pediatric emergency physicians

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ABSTRACT

Objectives: Elbow injuries in children are a common presenting complaint to the emergency department. Although radiography is a valuable tool in the diagnosis of this injury, x-rays of the injured elbow are inherently difficult to interpret. As a result, comparison views of the uninjured arm have traditionally been recommended to provide an anatomically "normal" radiograph. Recent studies have questioned the use of comparison views in the pediatric emergency department. The primary objective of this study was to determine current practices of non-pediatric emergency physicians in the use of comparison views for the diagnosis of elbow injuries in children.

Methods: A self-administered mail survey was sent to 300 randomly selected emergency physicians, using the Canadian Association of Emergency Physicians database.

Results: Two hundred and forty-two (81%) responses were received; 26 were excluded based on pre-determined criteria. Of eligible respondents, 95% ordered comparison views selectively and 64% of these physicians ordered comparison views infrequently. Eighty-eight percent found the comparison views to be "rarely" to "sometimes" useful. Forty-seven percent of respondents stated that they were only "somewhat" confident when interpreting x-rays of a child's elbow.

Conclusion: This survey demonstrates that non-pediatric emergency physicians are using comparison views selectively for elbow injuries in children, despite being only "somewhat" confident in interpreting the x-rays.

Key words: elbow; comparison radiographs; comparison x-rays; pediatrics

RÉSUMÉ

Objectifs : Les blessures au coude chez les enfants sont une raison de consultation courante au département d'urgence. Bien que la radiographie soit un outil précieux dans le diagnostic de cette blessure, les clichés du coude blessé sont en soi difficiles à interpréter. Par conséquent, on recommande couramment le recours aux clichés de comparaison du bras non blessé pour offrir une radiographie anatomiquement «normale». Des études récentes ont remis en cause le recours aux clichés de comparaison au département d'urgence pédiatrique. L'objectif principal de la présente étude était de déterminer les pratiques actuelles des médecins d'urgence non pédiatriques quant au recours aux clichés de comparaison pour le diagnostic des blessures au coude chez les enfants.

Méthodes : Un sondage auto-administré fut envoyé par la poste à 300 médecins d'urgence choisis

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au hasard dans la base de données de l'Association canadienne des médecins d'urgence.

Résultats : Deux cent quarante-deux sondages (81 %) furent retournés; vingt-six furent exclus à partir de critères prédéterminés. Parmi les médecins admissibles, 95 % demandaient des clichés de comparaison dans certains cas et 64 % de ces médecins demandaient des clichés de comparaison à l'occasion. Quatre-vingt-huit pour cent des répondants trouvaient les clichés de comparaison de «rarement» à «parfois» utiles. Quarante-sept pour cent des répondants se dirent seulement «plutôt» confiants au moment d'interpréter les radiographies du coude d'un enfant.

Conclusion : Le présent sondage démontre que les médecins d'urgence non pédiatriques ont recours aux clichés de comparaison de manière sélective pour diagnostiquer des blessures au coude chez les enfants, bien qu'ils soient seulement «plutôt» confiants au moment d'interpréter les radiographies.

Introduction

Elbow injuries are common in the pediatric population and represent a significant number of visits to the emergency department (ED).¹ These injuries range in severity from soft tissues injuries to fractures or dislocations requiring operative management. A significant proportion of the injuries are subtle fractures that require accurate diagnosis to optimize healing, minimize pain and prevent complications.

Radiographs are often ordered to augment the history and physical exam and determine the extent of injury. Radiographs of a child's elbow are inherently difficult to assess because of the numerous ossification centres that appear at different ages, as well as the presence of multiple growth plates that fuse at different stages.^{2,3} As a result, comparison views of the uninjured arm have traditionally been recommended for all elbow injuries⁴ to provide the clinician with an anatomically "normal" radiograph. However, studies by Chacon and coworkers⁵ and Kissoon and colleagues⁶ have demonstrated that among pediatric specialists (pediatric emergency medicine, orthopedics, radiology) there is no diagnostic utility for the routine use of comparison views. Use of comparison views by non-pediatric emergency physicians (EPs) has not been assessed. As such, the objectives of this study were to 1) determine current physician practices in the use of comparison views for elbow injuries in children by non-pediatric EPs in Canada; 2) identify factors that contribute to EPs' decisions to order comparison radiographs; and 3) ascertain physicians' estimates of the benefit of comparison radiographs in improving diagnostic accuracy.

Methods

Survey tool

A standardized self-administered questionnaire was developed, piloted among a group of pediatric EPs, and mailed to 300 EPs between Nov. 1 and Dec. 15, 2003.

These 300 EPs were randomly selected from the Canadian Association of Emergency Physicians (CAEP) membership database, and represent a 20% sample. Initial survey questions sought to identify respondents unable to complete the survey in English, those with a primary emergency practice of pediatric emergency medicine (as self-determined by the respondent), physicians in training, and non-physician CAEP members; respondents from these groups were excluded.

Study protocol

The survey was administered using Dillman's Tailored Design Method for mail and Internet surveys.⁷ This methodology uses repeated mailings to maximize survey response rates while preserving the anonymity of the responders. The Research Ethics Board of the Children's Hospital of Eastern Ontario approved the study.

Data entry and analysis

All data were entered into Microsoft Access (2000) and analyzed using SPSS (v. 12). Overall response rates were calculated, and univariable frequencies were determined. To assess associations between independent factors and practice patterns, Mantel-Haenszel and chi-squared tests were used, with Fisher's correction in cases of small cell counts. Because of problems with small cell counts, questions with 5 possible answers were collapsed into 3 categories to increase the statistical strength. In all cases, because this survey aimed to generate rather than test hypotheses, adjustments were made for multiple testing by setting alpha at 0.01.⁸

Results

Respondents

Of the 300 EPs surveyed, 242 responses (81%) were received. Exclusion criteria, defined a priori, resulted in the exclusion of 26 respondents. Reasons for exclusion, indicated by these respondents: their primary practice was pe-

diatric emergency medicine ($n = 13$); they were trainees or allied health members ($n = 2$); or there were no pediatric patients in their practice ($n = 11$). The remaining 216 respondents are described in Table 1.

Comparison views

Of eligible respondents, 95% (206/216) ordered comparison views selectively. Of the 10 physicians who ordered comparison views routinely, 7 did so because of ED or hospital protocol and 3 did so because of personal preference. Figure 1 shows that comparison views were ordered infrequently (<25% of the time) and that their perceived utility was limited: 93% of respondents reported that comparison views “never” (5%), “rarely” (45%) or only “sometimes” (43%) influenced their initial diagnosis. Only 7% of respondents reported that comparison views “usually” (6%) or “always” (1%) influenced their diagnosis.

Table 1. Qualifications and work environment of the 216 non-pediatric emergency physicians who were included in the study

Variable	No. (and %)*
Years working in the ED, mean (and SD)	10.2 (7.5)
Highest level of training	
CCFP/GP	48 (22)
CCFP/EM	115 (54)
FRCP-EM / ABEM	48 (22)
Other (Sports Medicine, Anesthesia)	5 (2)
Volume of patients per year in respondent's ED	
<20 000	10 (4)
20 000–39 999	63 (29)
40 000–60 000	66 (31)
>60 000	77 (36)
ED patients in pediatric age group, %	
0–59	21 (10)
6–10	37 (17)
11–15	63 (29)
>15	92 (43)
Did not respond to query	3 (1)
Orthopedic services	
Available in the ED	135 (63)
Follow-up available in the community	22 (10)
Available at another ED	59 (27)
Availability of radiologists	
In-house 24 hours per day	43 (20)
In-house coverage 0900–1700	155 (72)
Radiographs sent out for interpretation	14 (6)
Radiographs only interpreted by EP	3 (1)
Did not respond to query	1 (<1)

*Unless otherwise indicated.

ED = emergency department; SD = standard deviation; ABEM = American Board of Endocrinology & Metabolism; EP = emergency physician

The factors most important in deciding to selectively order a comparison view were “confirmation of normal anatomy” (44%) and “x-ray suggestive of fracture” (33%). The remaining reasons included physical exam findings (10%), age of patient (9%) and mechanism of injury (1%). Three percent did not respond to that query.

Physician confidence

Forty-two percent of the non-pediatric EPs stated they were “confident,” but more than 50% stated they were “somewhat confident” or lower (i.e., “minimally” or “not confident”), when interpreting radiographs of children's elbows (Table 2).

Associations

We evaluated the association of 18 predictor variables (e.g., patient volume, years of experience, pediatric patient volume, level of training, orthopedic backup, radiology in-house) with the reported use of comparison views, the perceived utility of these views, and perceived confidence in interpreting these views. Four associations were statistically significant at the adjusted criterion for significance of

Table 2. Non-pediatric emergency physicians' perceived confidence in their ability to interpret the radiographs of children's elbows

Questionnaire response	No. (and %) of respondents $n = 216$
Not confident	2 (1)
Minimally confident	13 (6)
Somewhat confident	102 (47)
Confident	90 (42)
Extremely confident	9 (4)

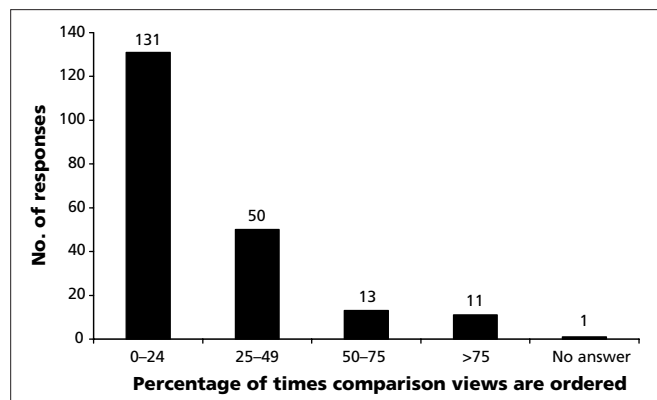


Fig. 1. The frequency with which comparison view radiographs are ordered among the 206 non-pediatric emergency physician respondents who order these views selectively.

0.01. Intuitively, physician confidence interpreting radiographs of children's elbows increased as the percentage of pediatric patients increased ($p = 0.01$). Next, as the amount of EM training increased (CCFP to CCFP-EM to FRCP-EM), the perceived influence of comparison views on diagnosis decreased ($p = 0.009$). The availability of orthopedic backup in the ED compared with delayed or distant orthopedic support, was associated with lower rates of ordering comparison views ($p = 0.004$). Finally, physician confidence in interpreting radiographs of children's elbows appears to be negatively influenced by the availability of radiology in-house 24/7 ($p = 0.007$).

Discussion

Although the use of comparison views has been studied in the pediatric ED setting,^{5,6} this is the first study to explore the current practices of EPs who do not work primarily in a pediatric ED. The results from this survey demonstrate that the vast majority of non-pediatric EPs selectively order comparison views for elbow injuries. This is consistent with current practices in all but one Canadian pediatric ED, and illustrates that non-pediatric EPs are practising in accordance with the recommendations for pediatric EPs.⁶ Selective use of comparison views not only reduces radiation exposure but also decreases health care costs.

Non-pediatric EPs who order comparison radiographs selectively report that these views "rarely" or only "sometimes" influence the diagnosis. Although this survey only subjectively assessed the utility of comparison views, this finding is consistent with evidence from 2 studies^{5,6} showing that diagnostic accuracy did not improve with the addition of comparison views.

Although we hypothesize that comparison views have limited utility for non-pediatric EPs, as they do for pediatric EPs, further research is needed to confirm this.

The fact that more than 50% of respondents were, at most, only "somewhat confident" highlights the need for objective evidence of their interpretation accuracy. If x-ray interpretation skills are poor, then further training or continuing medical education should be provided to remedy this issue.

There was a statistically significant association between volume of pediatric patients seen and self-stated confidence in interpreting the radiographs. This confirms our hypothesis that confidence, and likely diagnostic accuracy, are maintained by a steady exposure to this patient population, as seen in other studies of maintenance of competence.⁹

Limitations

First, self-reporting is an inherent limitation of any survey

assessing practice patterns. Physicians were asked to estimate the frequency that they order comparison views, the perceived utility of these views, and their confidence interpreting radiographs of children's elbows; these are all subjective measures.

Second, because no single database captures all practising EPs in Canada, we did not have a total census from which to sample. Instead, the CAEP membership was used as a proxy representation of Canadian EPs. This may have introduced a selection bias if the CAEP membership is not representative of all Canadian EPs; however, if the CAEP membership is representative of all Canadian EPs, then the validity of our findings is supported by our 81% response rate from a random sample of 20% of the CAEP membership.

Conclusions

Most Canadian EPs who do not consider their primary practice to be pediatric order comparison radiographs of a child's uninjured elbow on a selective and infrequent basis. Further research is required to determine the accuracy of radiograph interpretation by this group, and the effects of selective radiograph ordering on patient outcomes and health care expenditures.

Competing interests: None declared.

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