Risk Factors for Increased Severity of Paediatric Medication Administration Errors

Facteurs de risque et sévérité accrue des erreurs d'administration de médicaments en pédiatrie

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Abstract

Patients' risks from medication errors are widely acknowledged. Yet not all errors, if they occur, have the same risks for severe consequences. Facing resource constraints, policy makers could prioritize factors having the greatest severe–outcome risks. This study assists such prioritization by identifying work-related risk factors most clearly associated with more severe consequences. Data from three Canadian paediatric centres were collected, without identifiers, on actual or potential errors that occurred. Three hundred seventy-two errors were reported, with outcome severities ranging from time delays up to fatalities. Four factors correlated significantly with increased risk for more severe outcomes: insufficient training; overtime; precepting a student; and off-service patient. Factors' impacts on severity also vary with error class: for wrong-time errors, the factors precepting a student or working overtime significantly increase severe-outcomes risk. For other types, caring for an off-service patient has greatest severity risk.
To expand such research, better standardization is needed for categorizing outcome severities.

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Résumé

Les risques d'erreurs de médication pour les patients sont vastement reconnus. Toutefois, les erreurs, quand elles ont lieu, ne présentent pas toutes les mêmes risques de conséquences graves. Dans le contexte des limites de ressources, les responsables de politiques pourraient prioriser les facteurs qui présentent les risques les plus graves. Cette étude permet de procéder à une telle priorisation en déterminant les facteurs de risques liés au travail qui sont les plus clairement associés à des conséquences graves.

Des données sur des erreurs potentielles ou réelles, provenant de trois centres canadiens de pédiatrie, ont été recueillies de façon anonyme. Trois cent soixante-douze erreurs ont été déclarées, avec des degrés de sévérité allant d'un simple retard à la mortalité. Quatre facteurs présentent une corrélation significative avec un risque accru de résultats graves : le manque de formation, les heures de travail supplémentaires, la supervision d'un étudiant et la présence d'un patient qui correspondrait normalement à un autre service. L'impact des facteurs sur le degré de sévérité varie également selon le type d'erreur : pour les erreurs de temps, la supervision d'un étudiant ou les heures supplémentaires augmentent significativement le risque de résultats sévères. Pour les autres types, les soins offerts à un patient qui correspondrait normalement à un autre service comportent le plus haut risque de sévérité.

Pour approfondir la recherche, il faudrait une meilleure normalisation pour catégoriser les taux de gravité des résultats.

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Thε risks of harm to patients posed by medication administration errors are well documented (Fortescue et al. 2003; Hicks et al. 2006; Kaushal et al. 2001; Leape et al. 1995; Rothschild et al. 2006; Tissot et al. 2003). It is also recognized that that many administration errors are due to problems at the system level (not just "human error") (Barker et al. 2002; Leape 2006; van den Bernt et al. 2002). A significant subset of those errors can lead to severe consequences (Cowley et al. 2001; Fortescue et al. 2003; Holdsworth et al. 2003; Kaushal et al. 2001; Miller et al. 2003;), but few studies have analyzed which work environment–related risk factors, in particular, are most clearly associated with the most severe patient outcomes.

Net risk is a function of both *probability* of an unwanted incident and *severity* of its consequence (Amyotte and McCutcheon 2006). Policy makers, being constrained by the costs of change implementation, could benefit by distinguishing measures that simply reduce some errors' frequencies, from those that address specifically the types of incidents that tend to generate more severe outcomes.

Based on a national sample in paediatric environments, the present study confirms that distributions of outcome severities are not equal for all error causes. Each cause can be associated with a specific distribution of probabilities for more severe error outcomes; this is the cause's severity risk profile. Knowing these profiles, decision-makers could focus on causes that have the greatest potential risks for severe outcomes.

The current nursing work environment cultivates error, not safety (IOM 2004). When work environments and processes are inefficient or unhealthy, the chance for errors affecting patient outcomes is increased (McGillis Hall et al. 2004; Smetzer and Cohen 2006). Excessive workloads and an inability to deal with fluctuations in patient census and severity of illness, variations in availability of experienced nurses to supervise novice nurses, and structuring of the patient environment lead to unsafe work environments (Leape et al. 1995). Tang and colleagues (2007) identified personal neglect, workload and new staff as the three primary factors contributing to adult unit errors.

Tissot and colleagues (2003) have linked workload and the work environment to medication error occurrence, in particular. The risk of error increases as nurses work shifts beyond 12 hours, take on overtime and/or work more than 40 hours per week (O'Brien-Pallas et al. 2004; Rogers et al. 2004).

Medication delivery is complex in all areas of healthcare, particularly for children, for whom paediatric medication errors have been identified as the most frequent type of medical error (Kaushal et al. 2001; Wong et al. 2004). Suitable formulations of many drugs for children are based solely on adult requirements (Carleton and Smith 2005; Giacoia et al. 2007; Kaushal et al. 2007), with adult dosages adjusted to account for smaller body mass.

For children, therefore, medication ordering, dispensing, administering and monitoring often require weight-based dosing calculations in the absence of standardized, easy-to-use paediatric dosage formulations (Byers and Schafhauser 2004; Giacoia et al. 2007). High-consequence dosing errors can also occur by the interchange of milligrams and micrograms (Kaushal et al. 2004) or by tenfold errors, resulting from non-suspicious small volumes (Kaushal et al. 2004; Wong et al. 2004).

Methodology

This pan-Canadian study examines, in a paediatric setting, the factors within the nursing work environment that contributed not only to medication administration errors, but more specifically, to an increase in the likely severity of errors that occurred. Factors leading to the occurrence of error were identified prospectively and then tracked using error survey data.

The data were collected from registered nurses who worked in 18 study units, in three tertiary paediatric university-affiliated healthcare centres in Canada. Participants voluntarily completed the survey (reproduced in the appendix) whenever an actual or potential error event occurred. To minimize concerns that could lead to under-reporting errors, the surveys were designed to be completed in a confidential manner with no nurse or patient identifiers, and were delivered to participants' units, accompanied by prepaid envelopes addressed to the researcher.

Tool development and validation

The survey instrument was the Paediatric Medication Administration Error (PMAE) survey, consisting of six questions, and independently created for this study. First, the paediatric incident-reporting systems currently utilized by the study sites were reviewed; then, specific survey

questions relating to the consequences of PMAEs were developed, adapting from the work of Folli and colleagues (1987). Face and content validity were ensured through the validation of experts. Ten reviewers with survey development experience – specialists in safety (n=5), nursing (n=2) or measurement (n=3) – were selected; six responded. Respondents were informed of the instrument's purpose and objectives, key definitions and the manner for rating the tool (Davis 1992; Grant and Davis 1997), and were asked to rate each question's representativeness, clarity and comprehensiveness (Rubio et al. 2003). Questions rated lower than 3 on a scale of 1 to 4 were reworked or removed. The overall content validity index (CVI) equalled the total number of items ranked at 3 or 4 divided by the total number of items. The survey's CVI was 0.95, signifying 95% agreement from reviewers on the tool's content validity.

In Question 3 of that reviewed survey, participants are asked to consider the applicability, for a given error, of each of 16 specific factors that the literature identifies as being linked to medication administration errors. No construct was hypothesized for aggregating these factors; exploring and comparing their respective severity distribution patterns, without initial assumptions, was a key study objective.

The PMAE tool was piloted at a children's hospital that was one of the study sites. The pilot used a sample of 20 staff nurses from different units who were given time from their shifts, asked to reflect on a medication administration error or potential error that they had experienced and to complete a sample survey on this experience. Respondents also commented on the wording of the questions and indicated whether any questions made them feel uncomfortable or upset.

The respondents' times for completion were observed, and respondents were asked whether they would be willing to complete similar surveys if they experienced a PMAE during actual data collection. If nurses expressed hesitation, the barriers to reporting and incentives to completion were explored. Feedback received was used to revise the tool's wording and to confirm a five-minute completion time. Following participants' recommendations, the definitions of what constituted an error and a potential error were appended to the final survey.

Data collection

Initial contact with study participants was made through an information session conducted in person by the researcher on all shifts at each unit over a one-week period. Training sessions for staff were provided to establish a common understanding of the variables and a standardized approach to completion. Refreshments were provided. During the initial meeting, the researcher delivered information letters and placed posters about the study on the units. Precoded surveys were delivered to units in hard copy, accompanied by prepaid envelopes. The surveys were completed by staff nurses who had directly experienced an error or potential error; then the completed surveys could be mailed back confidentially to the researcher using a prepaid envelope, or the anonymous surveys were collected from the units.

The dependent variable for the survey was the severity of the error's outcome. When an error occurred, participants were asked to rate the severity of its outcome (if the error actually

affected the patient) or the potential severity (if patient impact was prevented). Severity was measured on a 5-point Likert scale, ranging from "minimal" (1) to "lethal" (5). Participants were provided definitions and criteria for assigning these labels, adapted from Folli and colleagues (1987). For each recorded incident, the survey also inquired about environmental factors that may have contributed. These factors' impacts on incidents were measured on a 5-point Likert scale, ranging from "not at all" (1) to "significantly" (5). These 16 potential factors were analyzed: staffing, inexperience, insufficient training, knowledge deficit, involved in precepting, workload, overtime, distraction, recent patient transfer, off-service patient, shift change, lack of information, ineffective communication, equipment/supplies, fatigue and documentation. During analysis, the Likert-scale values for environmental factors were dichotomized such that values of at least "moderate" (i.e., 3 or above) were coded as "1" and smaller values were coded as "0."

Participants could also identify whether errors involved a failure in one or more of the five "rights" for dose administration, i.e., right time, route, patient, medication and dose. Each "right" variable was coded 1 if it was involved in the incident; otherwise, it was coded 2. An additional, derivative variable was coded from 1 to 8 for combinations of involved rights.

Data analysis

In analyzing the results of the survey, ordinary multiple linear regressions were used to identify a function of the contributing factors that could approximately predict the resulting severity of an incident. However, like any regression, resulting models would be based on the "average" impact of each included variable on the "average" outcome severity. Yet the distribution of incident severities is highly skewed (see Figure 1). Therefore, methods adapted from radiation and industrial safety analysis (Walsh and Goodman 1997; Goodman 2012) were used to analyze specifically the impacts of particular factors on the shape of the distribution of severities (especially regarding skewing towards extreme values). That peer-reviewed method uses an effect size measure based on the extent to which one distribution of outcome severities is more "shifted" towards the right (severe) end of possible outcomes than another distribution. (Compare the shapes of either distribution in Figure 2 to the distributions in Figure 3.) The point estimate for the effect-size measure is a percentage; namely, along the ordinal scale used to represent the lowest to highest possible severities for outcomes, it measures how far, as a percentage of that full distance, the distribution has shifted, from one distribution to the other.

In tests for severity shifts, the *p*-values are determined by re-sampling. The null hypothesis is that the effect size, as described above, is not significantly different from zero. On that hypothesis, the distribution of severities for a test sample (e.g., for cases involving a particular environmental factor) should be roughly identical to the severity distribution for the full population (approximated here by the pooled severity distribution for the entire available data set). We simulate drawing many random samples of size *n* from the hypothesized population, and calculate the effect size (sample statistic) for each case; the proportion of those simulated sample statistics (effect sizes) that are equal to or exceed the obtained value in the actual sample is the *p*-value.

With respect to the regressions performed, a minimum sample size of n=141 was determined for the number of incidents required to test the model for significance with potentially 16 independent variables, at alpha of .05, with a power of 0.80 to detect a moderate-sized effect. During the data collection window, no applicable records were excluded, so the final number of responses (errors documented) via the survey equalled 372.

Results

Three hundred seventy-two surveys were collected. Each survey documented one error, yet individuals could fill out multiple forms for separate errors; therefore, given anonymity, it is unknown how many unique nurses responded. The majority of reported errors, 240 (64.5%), were on the day shift, followed by 82 (22%) on the night shift; 50 (13.4%) records did not specify. Reports of both potential (127) and actual (245) PMAE occurrences were documented. Most errors reported were classified as "wrong time" (168 cases; 45.2%) or "wrong dose" (82 cases; 22%), with the remaining being "wrong medication" (8.3%), "wrong route" (2.7%), "wrong patient" (1.9%), "wrong time and dose" (0.8%) and "wrong patient and medication" (0.5%), as well as "other factors" (18.5%). No baselines for numbers for *error-free* dose administrations are known. The average rate of errors reported per unit in the study was 21, with a range of 1–43.

FIGURE 1. Overall distribution of incident severities (upper panel), with example of a non-significant shift in the distribution (lower panel)
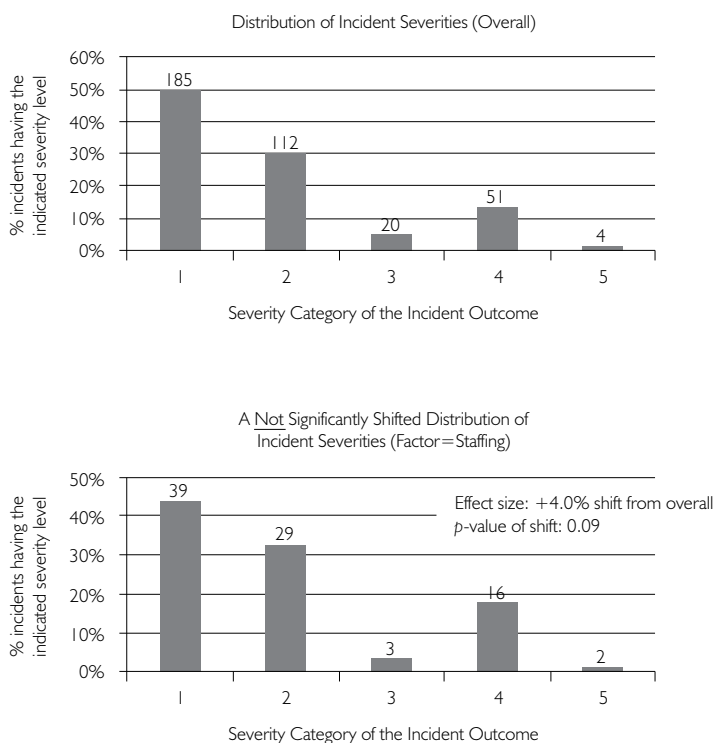
Given that a dose error (actual or potential) occurred during the sampling period, the severity of its impact could vary widely – from a delay in administration time up to, in the worst case, a fatality. The overall distribution of the outcome severities is shown in Figure 1 (top).

Note that for potential (i.e., near-miss) errors, the outcome severities were also potential, not actual. In these cases, the nurse recording the severity used specific rules to determine the appropriate value to record; for example, if the dose *nearly* administered was 10 times the normal dose, the severity was classified as level 4. A first check of the results was to compare the distribution of (potential) severities assigned in this manner, for near-miss cases, to the distribution for severities for known, actual errors. Figure 2 shows that the distributions are quite similar, suggesting that the severity estimates used for near-miss cases in subsequent calculations were generally realistic.
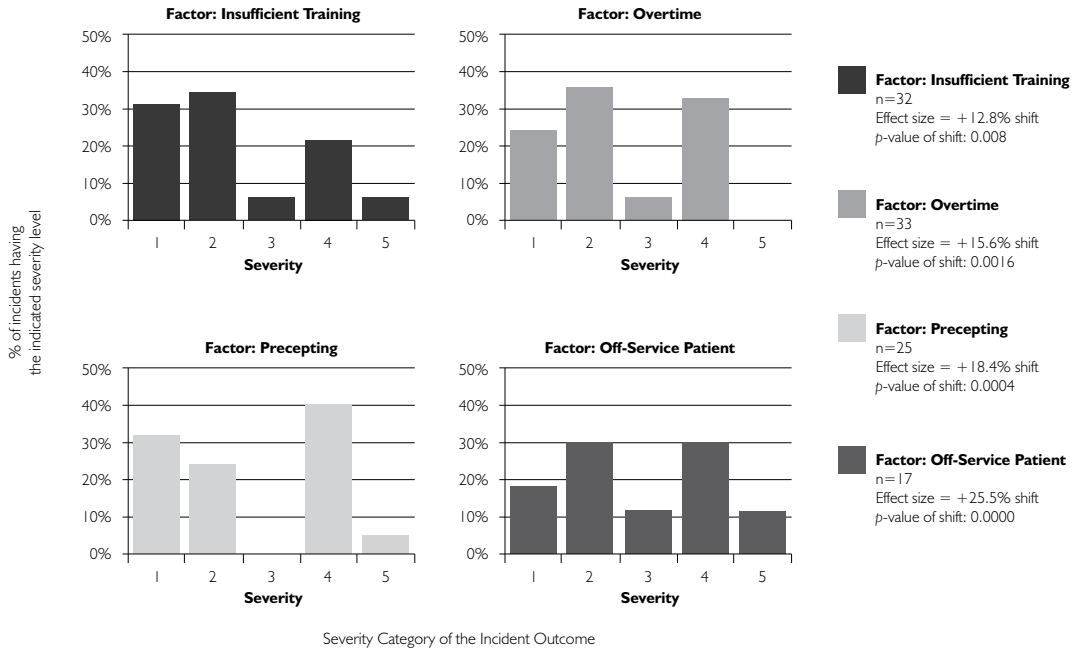
FIGURE 2. Distributions of severities of potential versus actual incidents
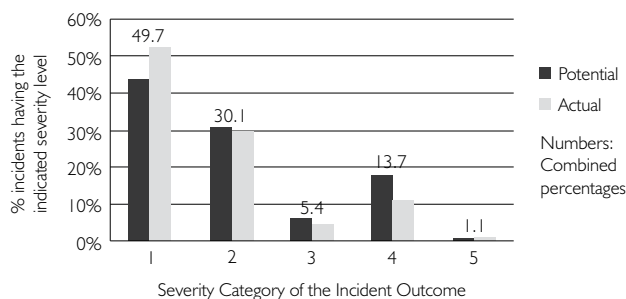

Similar distributions to those displayed in Figure 1 were generated for each of the nursing environmental factors considered. That is, for all records where a particular factor was deemed at least "moderately" applicable by participants (marked at least 3 on a 1–5 scale), the distribution within that subset of records of the corresponding outcome severities was observed. Of the 16 distributions so generated (one per factor), four of the environmental factors appeared to be correlated with increasing tendencies towards higher (less desirable) levels of severity. These four factors (see Figure 3) were insufficient training, overtime, precepting and off-service patient. The effect sizes for these factors ranged from 12.8%, for insufficient training, up to 25.5%, for off-service patient, and if tested as described in the Methods section, all *p*-values <.01. In contrast, compare the bottom panel of Figure 1, showing a factor (staffing) whose distribution pattern, or "profile," for severities of error outcomes is virtually the same as the overall data set's distribution.

Figure 4 shows the elevated potential for severe outcomes if the type of "wrong" committed was "wrong patient." The large effect size (+17.3%) conveys the seriousness of this error, although with n equal only to 11, the *p*-value is inconclusive (.048).

FIGURE 3. Four factors' severity distribution profiles, all shifted significantly from the overall population distribution

Severity Category of the Incident Outcome

FIGURE 4. Distributions of severities, given wrong patient

Severity Category of the Incident Outcome
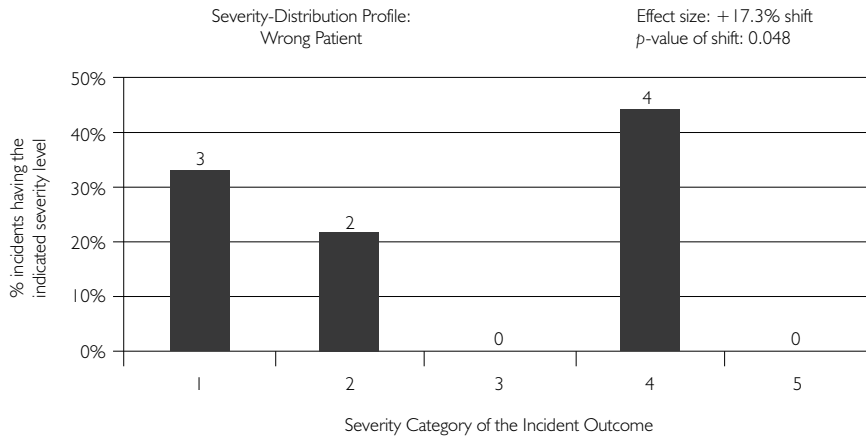
On the other hand, Figure 5 suggests that when an error did occur, it is generally less hazardous for the patient if the error was a timing mistake (comprising 46% of the sample), rather than an alternative (i.e., wrong route, patient, medication or dose). No fatalities were due to wrong time.

FIGURE 5. Severities, given wrong versus not-wrong time

TABLE 1. Outputs for logistical regression on contributors to wrong versus not-wrong time

Predictor	Coefficient	Std. Error of Coefficient	Z	P	Odds Ratio	(95% C.I.) Lower Bound	(95% C.I.) Upper Bound
Constant	-0.010	0.161	-0.06	0.950			
Mod+_Workload	0.627	0.222	2.83	0.005	1.87	1.21	2.89
Mod+_Documentation	-1.034	0.249	-4.16	0.000	0.36	0.22	0.58
Mod+_Knowledgedeficit	-1.051	0.351	-2.99	0.003	0.35	0.18	0.7
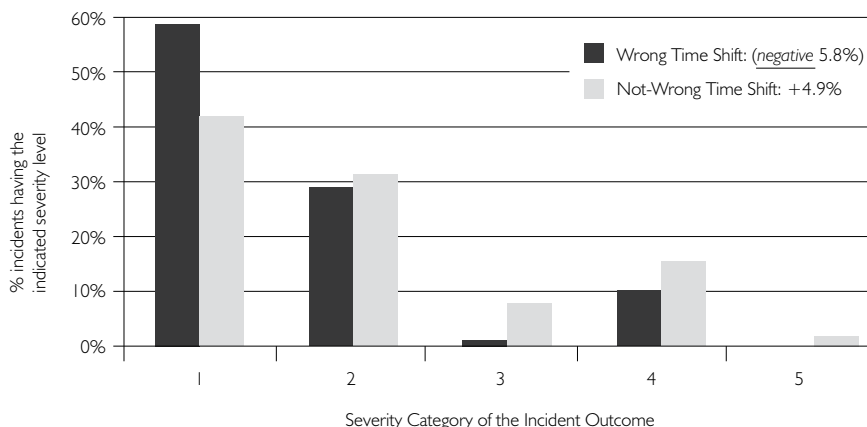
Given the importance of this error distinction, for time-based versus not time-based, it is useful to know what environmental factors contributed most to an error's falling into one or the other of these classifications. Table 1 shows the results of a logistical regression that explores the factors contributing to an error's being this safer type, "wrong time" (1), or not (0).

Should an error occur, the odds of its being a wrong-time error nearly double if the workload factor was involved (odds ratio [OR] = 1.87). However, if either documentation or knowledge deficit was a factor, then the odds of the error being a wrong-time error are reduced by a factor of three (OR ≈ .33), i.e., the chances increase for a more dangerous, not-wrong time classification. Combined with Figure 4, these findings suggest that dose administration incidents based on the factors documentation and/or knowledge deficit are more likely to be of the more dangerous, non-wrong time classification.

Based on the regressions with severity as a dependent variable, we find that different contributing factors are significant depending on whether the error is or is not a wrong-time error. Prior to constructing Table 2, below, correlations were found between some of the 16 factors being considered as independent variables (e.g., r=.67 between "inexperience" and "insufficient

training"). To avoid multi-collinearity in running the regressions where such correlations occurred, preference was given to retaining variables, if any, that were pre-identified as noteworthy in Figure 3. For wrong-time errors, the regression points to precepting and overtime as potential contributing factors. Precisely predicting an outcome's severity is not realistic with this model (see the small R-square in Table 2a), yet the model does show that, all else being equal, if either of the factors precepting or overtime are present in the incident, expect the mean likely severity to jump upward about two-thirds of a severity category. On the other hand, based on the regression displayed in Table 2b, we find that all else being equal, when the error is *not* wrong time, severity risk increases by over a full category if the environment factor off-service patient is involved, or a bit less if precepting is involved.

TABLE 2. Outputs for ordinary regression on contributors to severity level, given that the error (a) was or (b) was not "wrong time"

a. Regression to Estimate Severity—for Only *Wrong-Time* Cases:				
Predictor	Coeff't	SE of Coeff't	T	P
Constant	1.499	0.075	19.95	0.000
Mod+_Precepting	0.706	0.233	3.03	0.003
Mod+_Overtime	0.629	0.233	2.70	0.008
SE = 0.899883; R-square = 10.4%; Adjusted R-square = 9.3%				
b. Regression to Estimate Severity—for Only *NOT-Wrong-Time* Cases:				
Predictor	Coeff't	SE of Coeff't	T	P
Constant	1.968	0.082	24.02	0.000
Mod+_Precepting	0.868	0.411	2.11	0.036
Mod+_Offservicepat	1.159	0.369	3.14	0.002
SE = 1.11807; R-square = 8.1%; Adjusted R-square = 7.2%				

Discussion

In this study we documented the overall severities for PMAE occurrences (49.7% minimal, 30.1% significant, 0.05% serious, 0.14% potentially lethal and 0.01% lethal errors) and identified factors appearing to especially increase risks for more serious outcomes. Other studies recognize that outcome severities for dosing errors in the paediatric population can vary (Cowley et al. 2001; Fortescue et al. 2003; Holdsworth et al. 2003; Kaushal et al. 2001), and some authors identify, for various causes, distinct severity levels, such as (a) 15.9% potentially harmful versus 85.5% innocuous (Marcin et al. 2007), or 4.2% harmful (i.e., consequences ranging from temporary harm to death) (Hicks et al. 2006). Consistent, accepted categories and definitions for severity are yet to be developed in the literature.

Of 16 environmental factors examined for their potential impact on severity, we saw that four gave evidence of a significant effect: insufficient training, overtime, precepting and off-service patient. If a medication administration error occurs, the implication is that the involvement of one of these factors tends to increase likelihoods that more severe outcomes will ensue. Preventative measures might best target these factors.

Policy implications for professional preparation
Insufficient training, we have seen, contributes not just to errors but to more likely severe errors. This finding strengthens claims in the literature that the paediatric work environment has responsibility for ensuring adequate preparation of all paediatric nurses, including temporary and new staff, who may have had limited prior clinical experience in this area (Beecroft et al. 2001; Prot et al. 2005), especially as nursing programs in Canada continue to reduce or eliminate paediatric content. Knowledge of abbreviations (Levine and Cohen 2006) and of the rights of medication administration (Payne et al. 2007) should be refreshed.

Another risk factor for severe dose error outcomes is precepting. Hospitals must ensure that each shift has an appropriate mix of novice, trainee and more experienced nurses, so as not to overtax the realistic ability of preceptors to keep track. As noted by Elixhauser and colleagues (2003), combined staff experience and education contribute to patient outcomes.

Policy implications for the work environment
Another factor identified as increasing the risk for severe dose error outcomes was overtime. This finding complements those of other researchers that risks increase, generally, as nurses work shifts beyond 12 hours, take on overtime and/or work more than 40 hours per week (O'Brien-Pallas et al. 2004; Rogers et al. 2004). Work arrangements that add to off-service patients or, worse, provide conditions leading to wrong-patient errors can seriously increase the potential harm of mistakes.

Strengths and limitations of the study
This study's prospective design captured PMAEs at, or close to, the time of occurrence. The design enabled nurses to complete the tool anonymously without fear of repercussions for responding. Bi-weekly visits conducted by the researchers at the work sites encouraged participation of staff and provided an opportunity for ongoing educational sessions. The survey tool developed was subjected to both expert review and pilot feedback, and was short, readily available and easy to understand.

The study was limited by the lack of data collection pertaining to unit cultures, types of medication delivery systems in place and the types of medication involved in errors. Also, it is impossible to know the percentage of medication errors that were captured during the data collection window or the numbers of *error-free* medication administrations. Further, because all three sites were university-affiliated paediatric teaching hospitals, this factor may limit generalizability of findings.

Conclusion

When hospitals make decisions for improving medication administration safety, they should be particularly cognizant of factors that contribute most significantly to the likely severity of administration errors that may occur. Traditional policies that stress following the "five rights" protocol (right patient, drug, dose, time and route, and related documentation) are valuable, yet this study confirms the importance of an extra "right" – the right work environment. Four work environmental factors have been specifically identified that, if present in an error, significantly increase risk of severe outcomes, namely, training, overtime, precepting and off-service patient. While it would be helpful to compare these results with other studies addressing the potential severities of medication administration errors, attempts are limited owing to the absence of common definitions, categories and variables for addressing outcome severity. The authors recommend that this lack in the literature be addressed.

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Appendix A

Unit_____ Date_____ Shift _____

1. Which of the following type of error occurred? (Please circle)
a) **Actual** paediatric medication administration error
Actual Paediatric Medication Administration Errors are any preventable medication administration errors that occur as a result of human mistake or system flaws that occur in the process of administering a paediatric medication, regardless of whether an injury occurred or the potential for injury was present (adapted from IOM 2000). This will include any violation of the 5 "rights" of medication administration (right time, right patient, right dose, right route and right drug).

b) **Potential** paediatric medication administration error
Potential Paediatric Medication Administration Errors are any potential preventable medication administration errors that occur as a result of human mistake or system flaws that occur in the process of administering a paediatric medication, regardless of whether an injury occurred or the potential for injury was present (adapted from IOM 2000). This will include any potential violation of the 5 "rights" of medication administration (right time, right patient, right dose, right route and right drug).

2. What factor (s) below was involved in the actual or potential error? (Please circle)
Wrong Time (given late, given early, omitted, missed), explain_____
Wrong Route, explain _____
Wrong Medication, explain _____
Wrong Dose, explain_____
Other _____

3. What are the factors that contributed to the actual or potential medication administration error? Please rate the influence of <u>ALL</u> *of the following factors.*

Inadequate level of staffing	1 Not at all	2 Slightly	3 Moderately	4 Very Much	5 Significantly
Inexperienced staff	1 Not at all	2 Slightly	3 Moderately	4 Very Much	5 Significantly
Insufficient training	1 Not at all	2 Slightly	3 Moderately	4 Very Much	5 Significantly
Knowledge deficit	1 Not at all	2 Slightly	3 Moderately	4 Very Much	5 Significantly
Precepting a student	1 Not at all	2 Slightly	3 Moderately	4 Very Much	5 Significantly

Workload	1 Not at all	2 Slightly	3 Moderately	4 Very Much	5 Significantly
Overtime	1 Not at all	2 Slightly	3 Moderately	4 Very Much	5 Significantly
Distraction	1 Not at all	2 Slightly	3 Moderately	4 Very Much	5 Significantly
Recent patient transfer	1 Not at all	2 Slightly	3 Moderately	4 Very Much	5 Significantly
Off-service patient	1 Not at all	2 Slightly	3 Moderately	4 Very Much	5 Significantly
Shift change/handover	1 Not at all	2 Slightly	3 Moderately	4 Very Much	5 Significantly
Lack of information	1 Not at all	2 Slightly	3 Moderately	4 Very Much	5 Significantly
Ineffective communication	1 Not at all	2 Slightly	3 Moderately	4 Very Much	5 Significantly
Equipment/supplies	1 Not at all	2 Slightly	3 Moderately	4 Very Much	5 Significantly
Fatigue	1 Not at all	2 Slightly	3 Moderately	4 Very Much	5 Significantly
Documentation	1 Not at all	2 Slightly	3 Moderately	4 Very Much	5 Significantly

Other (If other, please explain) _____

_____

4. Please rate the level of patient consequence of the actual error or the potential error had it not been prevented. (Please read the definition and circle the appropriate number)

(1) A **minimal error** occurs when
    a)   an actual event occurs, but the patient is not harmed;
    b)   increased patient monitoring is required.
(2) A **significant error** occurs when
    a)   the drug dose is a half to four times the normal dose;
    b)   the dose administered is too low to treat a patient's condition;
    c)   one of the 5 rights are violated without serious consequences occurring;
    d)   the wrong I.V. fluid is administered without severe consequences;
    e)   patient requires an additional treatment or intervention due to error;
    g)   patient is temporarily harmed.
(3) A **serious error** occurs when
    a)   the route the drug is administered is inappropriate and could lead to potentially toxic results;

b) the drug dose administered is four to 10 times the normal dose;
c) the dose of the drug is in the toxic range;
d) the drug could exacerbate the patient's condition (drug–drug or drug to disease interaction);
e) the name of the drug is misread; therefore, administration of the wrong drug occurs;
f) prolonged hospitalization or transfer to ICU results.

(4) A **potentially lethal** error occurs when
a) the serum level results of the drug is in the severe toxicity range;
b) the drug being administered has a high potential to cause a life-threatening reaction;
c) the dose of a potentially life-saving drug is too low for treating the disease;
d) the dose administered is 10 times the normal dose;
e) permanent harm to the patient occurs;
f) near death event occurs.

(5) A **lethal** error occurs when: the error results in patient death.

5. How would you rate the quality of care that you were able to deliver to your patients and their families at the time that the actual or potential error occurred? (Please Circle)

1	2	3	4	5
Poor	Fair	Good	Very Good	Excellent

6. If you have answered POOR or FAIR in question 5, what are the factors that affected the quality of care at the time of the actual or potential error? Please rate the influence of <u>*ALL*</u> *of the following factors.*

	1 Not at all	2 Slightly	3 Moderately	4 Very Much	5 Significantly
Inadequate staffing	1 Not at all	2 Slightly	3 Moderately	4 Very Much	5 Significantly
Inexperienced staff	1 Not at all	2 Slightly	3 Moderately	4 Very Much	5 Significantly
Insufficient training	1 Not at all	2 Slightly	3 Moderately	4 Very Much	5 Significantly
Knowledge deficit	1 Not at all	2 Slightly	3 Moderately	4 Very Much	5 Significantly
Precepting a student	1 Not at all	2 Slightly	3 Moderately	4 Very Much	5 Significantly
Workload	1 Not at all	2 Slightly	3 Moderately	4 Very Much	5 Significantly
Overtime	1 Not at all	2 Slightly	3 Moderately	4 Very Much	5 Significantly

Fatigue	1 Not at all	2 Slightly	3 Moderately	4 Very Much	5 Significantly
Lack of information	1 Not at all	2 Slightly	3 Moderately	4 Very Much	5 Significantly
Ineffective communication	1 Not at all	2 Slightly	3 Moderately	4 Very Much	5 Significantly
Equipment/supplies	1 Not at all	2 Slightly	3 Moderately	4 Very Much	5 Significantly

Other (If other, please explain) _____

_____

If filling out this survey has aroused unpleasant feelings that you would like to discuss, please contact your Human Resources Department to gain access to your Employee Assistance Plan or contact your Occupational Health Department. Thank you.