



ISSN Print: 2394-7500  
ISSN Online: 2394-5869  
Impact Factor: 5.2  
IJAR 2016; 2(7): 737-741  
www.allresearchjournal.com  
Received: 16-05-2016  
Accepted: 17-06-2016

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## Effectiveness of instructional package on practices and occurrences of errors in intramuscular medication administration - A pilot study

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### Abstract

**Background:** Incompetent practices of health care providers along with inadequate health care systems, usually leads to the occurrences of errors in the provision of health care.

**Objectives:** To assess intramuscular medication administration practices of staff nurses and the occurrence of intramuscular medication errors before and after implementation of instructional package.

**Methods:** Quantitative approach with Quasi Experimental design (pre-test - post-test design) was used. A total of 44 events of intramuscular medication administration performed by 6 staff nurses working in paediatric O.P.D were observed, using event sampling technique, in two phases (pre implementation and post implementation). Observation Checklist was used for observing the medication administration events.

**Results:** The findings revealed that the computed t value (7.61) of administration practice was higher than the tabulated t value (2.00) at 0.005 level of significance between pre implementation and post implementation administration practices. Also the findings revealed a decrease in the number of errors/event in intramuscular route from (3.09) in pre implementation to (1.77) in post implementation.

**Conclusion:** The instructional package was effective in enhancing the administration practices and in reducing the occurrences of intramuscular medication error in paediatric O.P.D.

**Keywords:** Instructional package, intramuscular medication administration, intramuscular medication errors, observational checklist, occurrences, pre implementation, post implementation

### 1. Introduction

Today's era of health care organization is facing one of the biggest challenges for improving patient safety and in reducing medical errors world-wide. Adverse events in the health care system are one of the detrimental causes of death and injury among the patients in the world today and therefore is placing the health care professionals in a state of woebegone<sup>[1]</sup>.

Medication can be defined as "a drug or other chemical compound that can be administered into the human body, which affects the body in a beneficial way, by relieving symptoms, or either by removing or reducing the illness or a disease". Drug is a therapeutic tool which has a dualistic effect, it can cure, prevent or diagnose a disease, whereas, when improperly used can lead to patient morbidity and mortality<sup>[2]</sup>.

According to The National Coordinating Council for Medication Error Reporting and Prevention, a Medication Error" is any preventable event that may cause or lead to inappropriate medication use or patient harm while the medication is in the control of the health care professional, patient, or consumer. Such events may be related to professional practice, health care products, procedures, and systems, including prescribing, order communication, product labelling, packaging, and nomenclature, compounding, dispensing, distribution, administration, education, monitoring, and use"<sup>[3]</sup>

Ensuring the safe medication administration in children, who is particularly one of the most vulnerable groups of patients seeking health care is a biggest task in itself. This can be due to their unique physiological and developmental needs of their body. Medication administration and evaluation, both is essential to the nursing practice. Thus to administer medications safely and accurately to the client, the nurses must be skilled enough and up-to-date to the advancing scientific technology and the new creations in the pharmacology to apply this in their medication administration practices<sup>[4]</sup>.

**2. Methods**

The study was conducted with the approval of ethical committee of the university and written informed consent was also taken from staff nurses. By using event sampling technique, a total of 44 events of intravenous medication administration performed by 6 staff nurses working in Paediatric O.P.D, were observed using Observational Checklist, in December 2015.

The Observational Checklist of intramuscular medication administration in children consisted of 39 items and maximum possible score was 39 and minimum score was zero.

The pilot study was conducted at Paediatric O.P.D) at a selected teaching hospital, Haryana, in December 2015. By using event sampling technique, a total of 44 events of intramuscular medication administration performed by 6 staff nurses, were observed.

The pre implementation started from 1<sup>st</sup> day to 11<sup>th</sup> day, followed by administration of intervention on 12<sup>th</sup> day, and ultimately terminated on post implementation starting from 18<sup>th</sup> day to 29<sup>th</sup> day.

Starting from 1<sup>st</sup> day to 11<sup>th</sup> day of pre implementation, observations of 22 intramuscular administration events in paediatric O.P.D were completed.

On 12<sup>th</sup> day intervention was administered, in which instructional package was provided to 6 staff nurses working in the Paediatric O.P.D. Lecture, video based teaching, power point presentation and demonstration was provided to all the staff nurses in Demo Room of Paediatric medical ward, in the hospital.

Pre implementation phase was then followed by post implementation, which continued from 18<sup>th</sup> day to 29<sup>th</sup> day. Observation of observations of 22 intramuscular administration events in paediatric O.P.D were completed.

The collected data was organized and analysed according to the objectives of the study and the research hypotheses using descriptive and inferential statistics. The probability level of 0.05 was set.

**3. Result**

A total of 44 intramuscular medication administration events were observed in two phases by the researcher. The practices in the post implementation were higher than the practices in the pre implementation. The number of error/event also decreased in post implementation as compared from pre-implementation.

**Table 1:** Range, mean, median and standard deviation of pre-implementation and post-implementation practice scores of medication administration through intramuscular route in children

Intramuscular Route	Maximum Score	Range of score	Mean ± Standard deviation	Median
Pre-implementation	39	18-28	23.13±2.748	23
Post-implementation	39	23-32	29.13±2.475	29

N=44

Maximum score: 39

Minimum score: 0

The data in table 1 presented the mean of practice scores in Pre-implementation and Post implementation of Intramuscular administration route. The mean of post implementation (29.13±2.475) was higher than the mean of pre implementation (23.13±2.748). The minimum score obtained was 18 in pre implementation and the maximum score obtained was 32 in the post implementation.

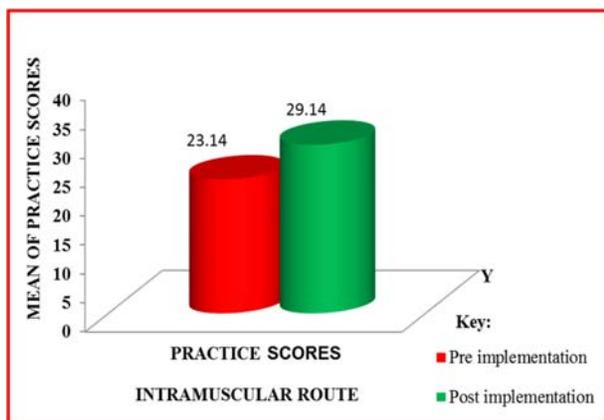
**Table 2:** Mean, mean difference, standard error of mean difference and “t” value of mean of pre-implementation and post-implementation practice scores of medication administration through intramuscular route in children

	Mean	M <sub>D</sub>	SE <sub>M<sub>D</sub></sub>	“t”	p value
Pre-implementation	23.13	6.0	.788	7.61	0.001*
Post-implementation	29.13				

N=44

‘t’ (42)= 2.000 (p≤0.05)

\*-significant at (p≤0.05)



**Fig 1:** Bar graph showing the mean of pre implementation, implementation phase and post implementation practice scores of medication administration through intramuscular route in children.

The data in table 2 presented the mean and t-value of pre-implementation and post implementation practice scores of intramuscular route. The mean of pre implementation (23.13) and of post implementation (29.13), the computed t value (7.61) was found to be significant at (0.05) level of significance, with a mean difference of (6.0). There was a significant difference in practices between the pre implementation and post implementation.

The data in the table 3 presented the area-wise mean and t value of practices in pre implementation and post implementation of intramuscular route. The finding revealed that the computed t values were higher than the tabulated t values at 0.05 level of significance in all the areas between pre implementation and post implementation. There was significant increase in practices in all the areas in post implementation as compared to pre implementation.

**Table 3:** Area-wise mean, mean difference, standard error and “t” value of pre-implementation and post-implementation practice scores of medication administration through intramuscular route in children

Area	Pre-implementation mean	Post-implementation mean	M <sub>D</sub>	SE <sub>MD</sub>	“t” value	p value
Before Administration	16.31	19.54	3.22	.539	5.98	0.001*
During Administration	3.68	5.18	1.50	.237	6.318	0.001*
After Administration	3.13	4.40	1.27	.341	3.72	0.001*

N=44

‘t’ (42)= 2.000 ( $p \leq 0.05$ )

\*significant at ( $p \leq 0.05$ )

**Table 4:** Percentage of total number of correct steps performed in pre implementation, implementation phase and post implementation during oral, intravenous and intramuscular medication administration route

Medication Administration Route	Items in Observation Checklist	Pre Implementation			Implementation Phase			Post Implementation		
		n	Total number of steps	Total number of correct steps (%)	n	Total number of steps	Total number of correct steps (%)	n	Total number of steps	Total number of correct steps (%)
Intramuscular Route	50	22 x2	1100	509 (46.2%)	--	--	--	22 x2	1100	641 (58.2%)

N=44

The data in the table 4 presented the total number of correct steps performed by staff nurses in pre implementation and post implementation in intramuscular medication administration. The finding revealed that maximum

numbers of correct steps (58.2%) were performed in post implementation as compared to (46.2%) in pre implementation.

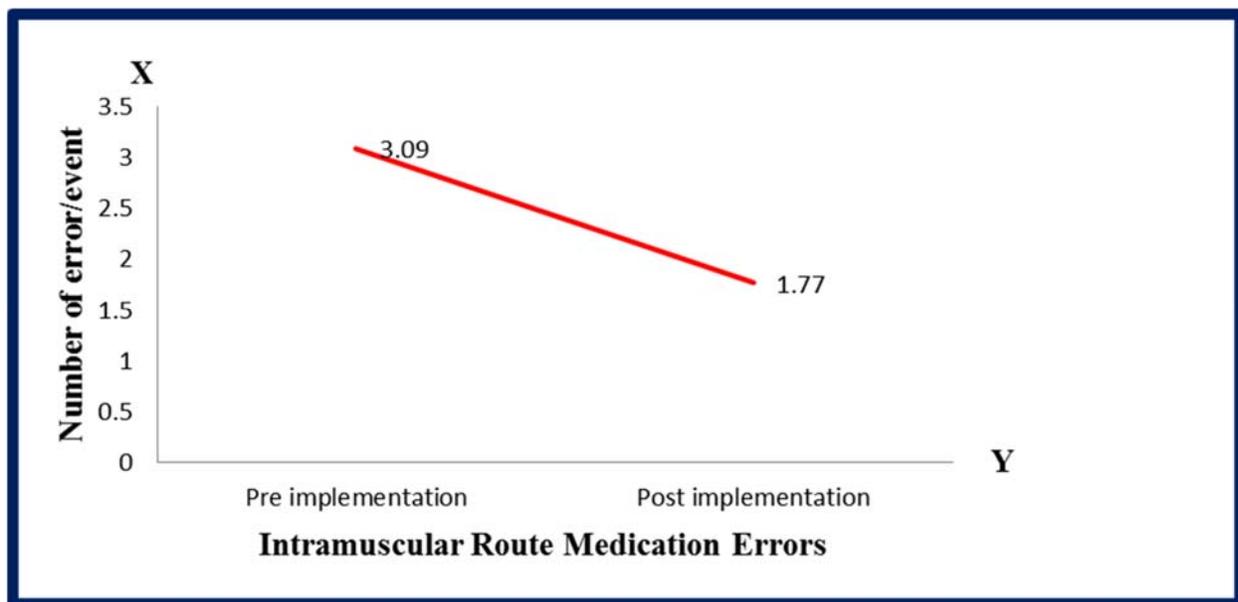
**Table 5:** Total error occurred, number of error per event, mean error score and mean percentage in pre implementation, implementation phase and post implementation of oral, intravenous and intramuscular medication administration route

Medication Administration Route		n	Total Error Occurred	Number of Error/Event	Mean Error Score	Mean %
Intramuscular Route	Pre-Implementation	22	68	3.09	0.20	20.60
	Post Implementation	22	39	1.77	0.11	11.81

N=44

The data in table 5 presented the total error occurred, number of error/event, mean error score and mean percentage in pre implementation and post implementation of intramuscular medication administration routes. The

findings revealed that the number of error/events was (3.09) in pre implementation which decreased tremendously to (1.77) in post implementation.



**Fig 2:** Line graph showing the number of error per event in intramuscular medication administration route

**Table 6:** Total error occurred, number of error per event, mean error score and mean percentage as per error classification in pre implementation and post implementation of intramuscular medication administration route

	n	Error Classification	Total Error Occurred	Number of Error/Event	Mean Error Score	Mean%
Pre implementation	22	Transcribing Error	26	1.18	0.23	23.63
		Dispensing Error	12	0.54	0.27	27.27
		Administrating Error	17	0.77	0.11	11.03
		Monitoring Error	13	0.59	0.59	59.09
Post implementation	22	Transcribing Error	15	0.68	0.13	13.63
		Dispensing Error	5	0.22	0.11	11.30
		Administrating Error	9	0.40	0.05	5.80
		Monitoring Error	10	0.45	0.45	45.45

N=44

The data in table 6 presented the total error occurred, number of error/event, mean error score and mean percentage as per error classification in pre implementation and post implementation of intramuscular route. The findings revealed that maximum number of error/event occurred in transcribing error (1.18) in pre implementation, as well as, in transcribing error (0.68) in post implementation. The number of error/event decreased in post implementation as compared to pre implementation.

#### 4. Discussion

The findings of the present study indicated that the staff nurses had below average to average practices regarding medication administration. These findings were consistent with the findings of the study conducted by Raja LRG, Fazlinee D, Syed Z. (2009) [5] to find out the knowledge, attitude and practice of nurses in using protocol for medication administration and the study concluded that nurses in UKMMC were found to have generally an average of knowledge (13.8%), practice (16.4%) and attitude (10.7%) in administering medication [5].

The findings of the present study revealed that the correct practices increased from (46.2%) in pre implementation to (58.2%) in post implementation. The findings also presented that the number of errors/event decreased from (3.09) in pre implementation to (1.77) in post implementation.

These findings were consistent with the findings of the study conducted by Niemann D, Bertsche A, *et al*, (2015) [6] on a prospective three step intervention study to prevent medication errors in drug handling in paediatric care and the study concluded that medication errors decreased to 116errors/441processes from 527errors/581processes after incorporation of handouts, training course and reference book provision [6].

The present study's findings were also consistent with the finding of the study conducted by Daniel G Ford, Amy L Seybert, *et al* (2010) [7] on impact of simulation based learning on medication error rates in critically ill patient and the study concluded that the medication administration error rates decreased from 30.8% to 4.0% in the initial post intervention observation and were sustained in the final post intervention observation. [7] The present study's findings were also consistent with the finding of the study conducted by Chedoe I, Molendijk H *et al* (2012) [8] on the effect of a multifaceted educational intervention on medication preparation and administration errors in neonatal intensive care and the study concluded that the incidence of errors decreased from 49% in pre intervention phase to 31% in post intervention after the incorporation of teaching and self-study (multifaceted educational intervention). [8] The present study's findings were also consistent with the

finding of the study conducted by Paula Otero, Andrea Leyton *et al* (2008) [9] on medication errors in paediatric inpatients: prevalence and results of a prevention program and the study concluded that the prevalence of medication errors rate in the second phase reduced to 7.3% from 11.4% medication error rates in first phase, after incorporation of several interventions. [9]

The present study concluded that medication administration is a complex area of paediatric nursing practice and instructional package is an innovative attempt to enhance the medication administration practices and also to reduce medication errors and thus recommended that there should be future based management strategies related to nursing medication practices. These findings were consistent with the findings of the study conducted by Rozario J M (2000) [10] to assess the knowledge and practices of nurses in administration of selected intravenous drugs in critical care units by using questionnaire. The study recommended regular drug training programme to improve the knowledge of nurses. [10]

#### 5. Limitations

The present study was confined to a single hospital setting, therefore, limiting the generalization of the study. Improved practice scores of staff nurses regarding medication administration could be a result of Hawthorne effect. Follow up of the errors occurred during the medication administration procedures, in terms of patient health outcome was not performed by the researcher.

#### 6. Conclusion

To put in the nutshell, the presented study concludes that there was significant enhancement in the practices of staff nurses in intravenous medication administration route, in all the shifts, in post implementation, as compared to pre implementation. As a teaching strategy, the instructional package was effective in enhancing the practices in intravenous medication administration in paediatric units.

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