Observational Checklist –As an Instrument to Measure Intramuscular Injection Administration Skills among Students in the Institute of Nursing, Kuwait

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Abstract:
There is no doubt that evaluation in nursing education for performance is an important activity with significant consequences. The outcome of an evaluation will have serious implications on students, teachers and eventually on the recipients of nursing care. This study aimed to measure Intramuscular Injection skills among students using structural demonstration session (with checklist) as compared with those using traditional teaching session (without checklist). The study was conducted at skills laboratory in the Institute of Nursing in Kuwait. A sample of 57 students enrolled in Medical Nursing was divided into two groups, experimental and control. A questionnaire was used to obtain student's socio-demographic characteristics and an observational checklist was developed to evaluate the student's performance in both groups. Pilot study was done on ten students to test the reliability of the checklist. The study findings indicated that all the differences between the two groups were not statistically significant. Regarding preparation of medication, it was found that there was no significant difference between the experimental and the control group except in four steps, while in the injection part, there was significant difference only in one step. The Findings have important implications for developing checklist and other tools for evaluating performance skills in the Institute to maintain the quality of nursing education and utilize effective methods in preparing future nurses. Instructors should focus their efforts to find the best tools to educate, train and evaluate the nursing students. Further study related to nursing procedures is needed with a larger sample and different nursing procedures.
Keywords: Observational Checklist, Intramuscular Injection, skills performance.

1. Introduction

Nursing care requires accuracy and proficiency in performing nursing procedures; therefore, nursing students are required to learn and perform these procedures perfectly in order to apply them correctly and efficiently. Nursing assessment of competencies is crucially important to maintain professional standard. Developing tools for evaluating student's performance is one of the most important duties required from faculties (Hassnein S., et al 2013). Nurse educators therefore play vital role in teaching and training the students who are evaluated during examinations. Teachers are challenged to measure their performance to become better professionals. Using the right tools help build teacher's confidence about their ability to accurately assess their students in the class. Observational assessment allows organizations to measure competencies to push the organizations to success (Farrell, J.,2015). Observational checklists are designed to help educators to identify areas of teaching and learning to achieve proficiency and provide valuable insights. Rosen, M. & Pronovost, P. (2014) confirmed that checklists are powerful tools for promoting and evaluating specified aspects of care or competences. They also considered checklists to become more prevalent in medical education and clinical practice. Teachers can integrate performance-based assessment into instructional process to provide additional learning experience for students. Brauldi, A. (2000) noted that rating checklist approach is recommended to indicate what degree the standards were met by using a numerical scale. In schools of nursing the term "checklist" is often used in relation with a list of steps in a procedure. It allows evaluators to watch students and to record information quickly about how they perform in relation to specific outcomes. Jeffies, Pamela R, (2002) admitted that skills checklists are often a core element of teaching strategies in nursing education. Checklists are used mainly in skills laboratory to guide students about the key behaviors to the right technique and instructors about the areas on which to evaluate them. Well-designed observational studies have been shown to provide similar to randomized controlled trials which can provide valid result, challenging the belief that observational studies are second – rate (Song, J. & Chung ,K. (2010).

In this current study, the checklist is applied on preparing medication and administering intramuscular (IM) injection among students in the Institute of Nursing, Kuwait. The WHO clarifies that injections are among the most common health care procedures. Every year at least 16 billion injections are administered worldwide WHO. Safety of injection; (1999).

Many researchers emphasize the importance of having a guideline to perform IM injection during education and practice to insure safety of the patient. Lala, KR &Lala, MK. (2003) concluded in their study that using guidelines along with clinical judgment can assist the clinician to ensure that the practice of IM injection is

evidence based. Knowledge of safe and proper IM injection administration technique is vital for health care providers, and it is important that nursing students, medical students and interns are trained correctly in this procedure (Srividya, B. et al 2015).

2.Aim of the study:

 The aim of this study was to assess the effectiveness of observational checklist as an instrument to measure intramuscular injection administration skills among students in the Institute of Nursing.

3.Objectives:

The purposes of this study were to:

1. determine the effectiveness of observational checklist for IM injection procedure.
2. measure the performance of the students after teaching and training with a structural demonstration session (with checklist).
3. measure performance of the students after traditional teaching session (without checklist).
4. compare the grades of students in both groups in performance based practice exam.
5.   assess the use of an observational checklist as an evaluation instrument.

4.Significance of the study:

In the Institute of Nursing, Kuwait there was a lack of evidence regarding the influence of using tools for evaluation and what is the most effective method to evaluate student's performance during nursing procedures. During practical examinations in the Institute, the performance of the students was unsatisfactory to most of the evaluators, with many mistakes, forgotten steps and negative remarks on their performance. Therefore, the need for a checklist was deemed necessary. This study will provide information on checklist as an instrument for measuring students' nursing skills and the need for other tools to improve performance among nursing students to ensure that all nursing procedures are done correctly, with confidence, and step-by-step instructions.

5.Method:

5.1 Design: A quasi- experimental design was utilized.

Setting: The study was carried out at the Institute of Nursing in Kuwait. The teaching sessions were held in the skills laboratory which was equipped with the needed teaching facilities: computer & data show, demonstration tools, instruments, injection simulators and models to assist the students to demonstrate the IM injection effectively.

5.2 Participants: The sample focused on 57 students: 34 females and 23 males, second level students (third semester) from three-year nursing program (6 semesters) enrolled in medical nursing course in the year 2016/2017.The sample was divided into two groups, A& B.

Group A, the control group, consists of 26 students: 14 females, 12 males.

Group B, the experimental group, consists of 31 students:18 females, 13 males.

5.3 Data collection Tools: To achieve the aims of the study, two tools were utilized:

   *Tool l: Student's socio-demographic characteristics was developed related to student code number, age, sex, nationality, marital status, number of children, and the last year grade point average (GPA).

   *Tool 2: An observational checklist (Please refer to Appendices A and B) was developed, guided by the book "Skills in Clinical Nursing, 2012." The checklist was divided into two parts:

   a- Preparing medication from a vial- powder, 25 steps.

   b- Administering IM injection, 17 steps.

      The checklist steps were rated with scoring points. The content was revised by two educators in the College of Nursing, Kuwait. The student's copy was translated into Arabic (the language of teaching). Two instructors of the Institute of Nursing, Kuwait revised the Arabic version to enhance clarity of the steps.

5.4 Ethical Considerations: Before starting this study a formal permission was obtained from the Deputy of the General Manager for Training Affairs, the General Manager of the Institute, and the Head of Nursing Department. The purposes of the study were explained to the nursing instructors, as well as the students. A written approval was taken from the instructors and participants; who were assured that all information obtained will remain confidential.

5.5 Pilot study: A pilot study was carried out to test the reliability of the checklist using Cronbach's alpha coefficient test. A sample of 10 students (second year second semester) were selected by simple random sampling technique and lottery method. The tool was proven to be reliable with Cronbach's alpha= (0.790) for

both checklists.

5.6 Procedure: The study started at the beginning of the third semester during the medical nursing course with the subject "Administration of Injections". The students were divided into two groups; A and B. Group A; the control group had a traditional lecture and demonstration session carried out (without a checklist). No checklist was provided to follow during the sessions or in skills laboratory and even in the clinical experience. Group B; the experimental group, had structural demonstration teaching sessions (with a checklist). It was distributed, explained, and demonstrated by the instructors to the students during the training sessions in skills laboratory. During clinical experience, the checklist was revised and practiced by the instructor supervising. The checklist was available to the students in this group to guide them for study and practice.

All subjects received the same text book, and trained with the same instruments, equipment and simulators which were available as a training strategy for assisting them to practice administering IM injection effectively. Within a three-hour session, the theory was explained and two practical hours were given for practicing the procedure in skills laboratory to the students in both groups. In the practical hours, the students were divided into small groups of five to six students each, under the supervision of an instructor. Each student in both groups had an equal opportunity for training and repeating the procedure more than once for further development of performance. In the clinical practice, each student in both groups had the chance to perform the IM injection on a real patient at least once. A practical exam was arranged and carried out in the same day to both groups. Each student was individually tested on preparing medication from vial powder and administering intramuscular Injection through dorsogluteal muscle. The same checklist was used to evaluate the procedure. Ten evaluators were assigned to evaluate the students. The grades obtained from the exam were not to be considered in the total student's grades in the current course.

5.7 Statistical methodology: Data were collected, reviewed, coded then entered into an IBM compatible computer, using the SPSS version 22 for Windows. Entered data were checked for accuracy then for normality, using Kolmogorov-Smirnov & Shapiro-Wilk tests, and proved to be not normally distributed. Qualitative variables were expressed as number and percentage while quantitative variables were expressed as median, and inter-quartile range (IQR) while mean ($\overline{X}$) and standard deviation (S) were calculated to describe the difference between both study groups when the median values were equal. The following statistical tests were used:

1. Independent samples Mann-Whitney's U-test (or Z-test) was used as a nonparametric test of significance for comparison between two sample medians.
2. A 5% level is chosen as a level of significance in all statistical significance tests used.

6.Results:

The median and IQR were used. In this study, there were two groups the experimental group (n=31) and control group (n=26). Out of the experimental group, 13 were males and 18 were females, whereas out of the control group, 12 were males and 14 were females. The results show that just more than half of the study subjects (51.6%) in the experimental group were non-Kuwaitis, while they represented 61% in the control group. Most of the subjects were single, 87.1% in the experimental group and 69.2% in the control group. The overall mean age of the experimental group was 22.39 ± 3.40 years, while that of the control group was 22.62 ± 3.70 years. There was no statistically significant difference between both groups (p>0.05). The same pattern was encountered when the gender of the students studied was considered (p>0.05).

In general, the values of the "mean" score for items of the procedures of preparation of medication are higher in the experimental group when compared with the control group except for: step 14 "*Remove protective cover from vial/use antiseptic swab*", step 21 "*Draw the medication prescribed*" and step 22 "*Withdraw the needle/Recap*". However, all these differences were not statistically significant, as calculated by the Mann-Whitney's Z test.

Table (1): Comparison between both groups of the study according to preparing medication and administering Intramuscular Injection

Step #	Procedure	Experimental n=31			Control n=26			Z	p-value
		Min	Max	Median (IQR)	Min	Max	Median (IQR)		
A	**Preparing medication from vial/powder**								
3	Prepare equipment including medication.	0	1	1.00(0.00)	0.5	1	0.75(0.50)	3.227	0.001
16	Withdraw needle from the vial and recap.	0.25	0.25	0.25(0.00)	0	0.25	0.25(0.00)	2.245	0.025
18	Check name of medication for second time.	0	0.5	0.50(0.25)	0	0.5	0.00(0.50)	2.268	0.023
24	Check medication name for third time. Dispose vial.	0	0.75	0.75(0.75)	0	0.75	0.00(0.75)	1.996	0.046
B	**Administering intramuscular Injection**								
11	Withdraw needle with steady, smooth, straight way in same angle of insertion.	0	0.75	0.75(0.00)	0.25	0.75	0.75(0.00)	1.977	0.048

Table (1) shows comparison between both groups of the study according to preparing medication from vial/powder. It was found that the mean score of the experimental group was higher than that of the control group in relation to: step 3 "*Prepare equipment including medication*" (p=0.001), step 16 "*Withdraw needle from the vial and recap*" (p=0.025), step 18 "*Check name of medication for second time*" (p=0. 023) and step 24 "*Check medication name for third time. Dispose vial*" (p=0.046).
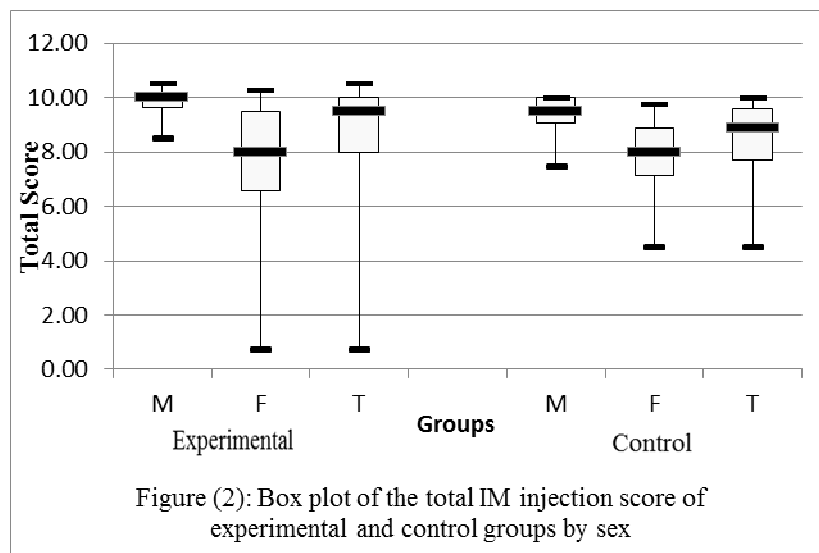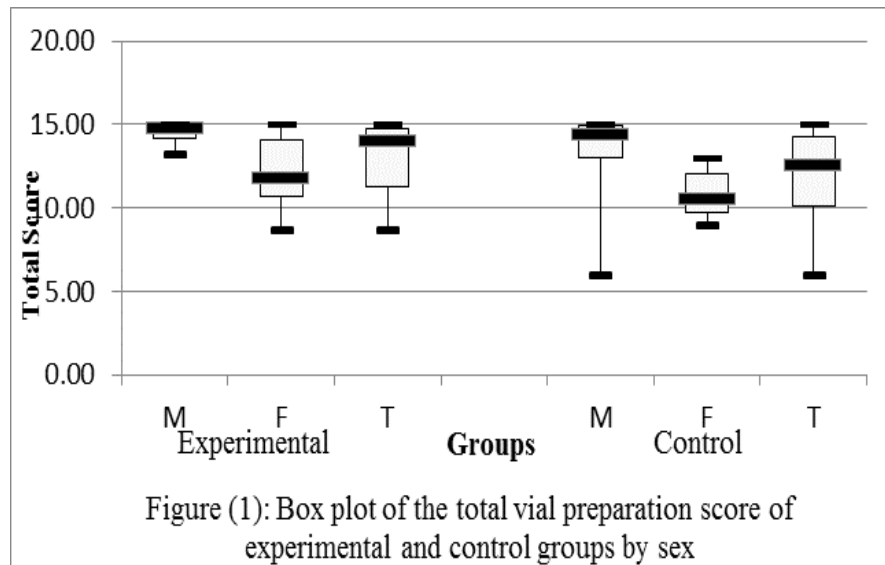
The results also showed comparison between both groups of the study according to administering Intramuscular Injection. In general, the mean score of nine out of the 17 steps of the procedure of administering intramuscular Injection, were higher in the experimental group (i.e. steps 1, 2, 8, 10, 13, 14, 15, 16 and 17) and five steps of the procedure had higher mean score in the control group (i.e. steps 3, 5, 6, 7 and 9). Only two steps of the procedures had an equal mean score (i.e. step 4" *Allow skin to dry/ keep a dry cotton between your fingers''* and step 12" *Press on injection site with a dry cotton*".

All the differences were not statistically significant as calculated by the Mann- Whitney's Z test, except for step 11 "*Withdraw the needle with steady, smooth, straight way and same angle of insertion*", where the mean score in the experimental group was less than that in the control group (p= 0.048).

Table (2): Comparison between both groups of the study according to total duration of procedures and gender

Sex	Experimental				Control				Z	p-value
	n	Min	Max	Median (IQR)	n	Min	Max	Median (IQR)		
M	13	6.46	14.2	8.00 (2.22)	12	5.47	14.62	11.76 (3.78)	2.886	0.004
F	18	6.90	20.0	10.00 (3.33)	14	4.48	12.15	8.42 (3.94)	1.967	0.049
All	31	6.46	20.0	9.00 (2.19)	26	4.48	14.62	10.00 (4.34)	0.723	0.470

Table (2) shows comparison between both groups of the study according to total duration of procedures in minutes and gender. It was found that there was no statistically significant difference between both groups, where p=0.470. However, when the gender was considered, the following was noted the median duration of procedures is significantly shorter in the male experimental group "8.00(2.22)" minutes, when compared with the male control group "11.76(3.78)" minutes, where p=0.004. The reverse was noted among females where the median duration of procedures is significantly longer in the female experimental group "10.00(3.33)" minutes, when compared with the female control group "8.42(3.94)" minutes, where p=0.049.

Figure (1): Box plot of the total vial preparation score of experimental and control groups by sex

Figure (2): Box plot of the total IM injection score of experimental and control groups by sex

Figures (1) and (2) illustrate Boxplot of the total scores of the experimental and control groups by sex for preparing medication from vial and administering intramuscular Injection, respectively. There was no statistically significant difference between both groups, even when gender of students was considered.

7.Discussion:

No research has been done regarding evaluating teaching methods of psychomotor nursing skills in the Institute. This study was conducted to assess the effectiveness of using an observational checklist in teaching and training to measure intramuscular injection administration skills among students in the Institute of Nursing, Kuwait. The data analyzed suggested that the two-selected methods of teaching were equally effective for facilitating nursing performance of administering IM injection in nursing skills laboratories. This matches with the study of Kerray, L. (1994) which found no statistically significant differences between the experimental group and the control group and concluded that both teaching techniques were effective. However, in the present study a comparison between the two groups showed that there is a difference between the experimental group and the control group but the difference is not statistically significant. This can be generally explained that students in the experimental group especially reacted poorly during the exam as they interpreted that the results will not be included in their course grades. They were cooperative but not enthusiastic and motivated to perform their best for the exam. This agreed with the conclusion of Nogueira, MS et al. (1997) that students are responsible for their own learning, thus challenging the teachers to use new teaching methods on nursing undergraduate course.

Preparing medication and administering IM injection are identified as highly anxiety producing skill, as our students were exposed for the first time to this invasive procedure. This matches with findings of Lala, K. & Lala, M. (2003) that administering an IM injection is a complex psychomotor task that requires skill and knowledge and contains lot of techniques required for students to learn and practice step by step. Likewise, it is supported

by Hdaib, M. (2015) who suggested to consider the level of nursing students when conducting an educational session.

The current result showed that the students in both groups had similar results which may be explained that nursing students have sufficient theoretical knowledge, revision and opportunities to practice the procedure. This matches with El-Demerdash et al. (2015) results who found that about 70 percent had adequate knowledge regarding documentation and preparation phase of intramuscular injection due to laboratory training and adequate practice of IM injection.

Results in this study revealed that both groups nearly had similar results, due to teachers in both groups doing their best to facilitate the training environment for the students to acquire the skills as they provide them with time to train to practice with guidance and feedback. This result may be similar with the findings of El-Demerdash et al. (2015) that the highest percent of nursing students have adequate skills of intramuscular injection due to clinical teachers providing students with adequate opportunities to acquire knowledge as well as to practice application of theoretical knowledge.

Although the results were not statistically different, as shown by the different p-values of Mann-Whitney's Z test, it was found that the mean score of the experimental group was higher than that of the control group in relation to: step 1 "Prepare equipment including medication" (p=0.001); step 14 "Withdraw the needle from the vial and recap" (p=0.025); step16 "Check name of medication for the second time" (p=0. 023); step 22 "Check for medication name for the third time. Dispose the vial" (p=0.046). This may be explained that studying from a specific written instruction on a performance checklist made the experimental group students acquire the skills to perform the procedure step by step and memorize them, comparing to the control group who missed important principles in preparing medication. This result matches with Zohre Ghamari Zare et al. (2013) that nursing students need written steps to follow in a procedure while teachers need to implement actions to strengthen the student's skills in medication therapy. They also stressed on the need for evidence based guidelines to be prepared and instructed to all nurses and nursing students. Moreover, the result agreed with the findings of Sakic, B. et al. (2012) who confirmed the need for written instruction for implementing these procedures in all health institutes to carry it out uniformly and prevent adverse events.

The present study showed the similarity of the results between the two groups which may be explained because of the use of same instructors as evaluators in the control group, making the students feel relaxed, confident in their performance and therefore took less time to perform the procedure as compared with the other group. The students of the experimental group were assessed by evaluators who were not their instructors, thus making them more tense, anxious and frustrated while performing the procedure and thereby affecting their results and taking more time to perform. This appears in the duration of the procedures which is significantly longer in the female experimental group (10.51+3.17 minutes), when compared with the female control group (8.12+2.25 minutes), where p=0.049. This is be supported by the research of Nogueira, MS. et al (1997) which used a nurse examiner who had no knowledge of the group to which a student belongs.

8.Conclusion:

Though the findings were not significant, the study does offer some evidence that checklist is an effective teaching method, as results cannot be generalized for all nursing students in all procedures. If we use the checklist correctly, it can shape the future of nursing education in the Institute. It also can be a method towards standardizing other nursing procedures to improve knowledge and performance among nursing students in the Institute. Using checklist correctly may encourage the students to become confident and proficient with their clinical skills. Moreover, it is important to continue to develop more and better comprehensive measures to teach and evaluate students, in their journey towards becoming a nurse.

9.Limitations of the study:

This study has several limitations that need to be considered in further researches:
1- small sample size;
2- practice outside the skills laboratories which cannot be controlled;
3- use of different nurse instructors training students in the nursing skills laboratory;
4- differences in the training approach of the nursing instructors which cannot be controlled and may have affected student's performance.

10.Recommendations:

As a result of this study, it is recommended to:
1. repeat the current study as well as different nursing procedures with a larger sample size.
2. encourage all nursing students to try their best in maximizing the advantages of the checklist in studying and practicing to gain and develop the skills.
3. develop and improve clinical guide checklists to improve nursing student's abilities even in other procedures.

4. use the checklist in teaching, training and evaluating student's performance and utilize it as evidence - based teaching.

5. train the examiner before the evaluation and have them demonstrate their ability to evaluate in order to set same standards.

Acknowledgment

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Appendix A: preparing medication from vial/powder

#	Procedure
1	Read doctor's order or the prescription sheet.
2	Wash hands.
3	Prepare equipment including medication.
4	Check name of medication for the first time.
5	Calculate the right medication dosage prescribed.
6	Flick ampule (solvent) several times.
7	Break off the upper neck of ampule using a gauze.
8	Choose correct size for syringe and needle.
9	Attach the needle on the syringe.
10	Remove the cap from the needle/Insert the needle into the ampule.
11	Withdraw medication from ampule correctly. Hold the ampule on its side using aseptic technique.
12	Recap the needle.
13	Dispose the empty ampule in the sharp box.
14	Remove the protective cover from the vial. Use antiseptic swab if needed.
15	Insert needle into the middle of the rubber cover and push the solvent inside the vial
16	Withdraw the needle from the vial and recap.
17	Dissolve the powder by rotating the vial between the palms. Avoid shaking.
18	Check name of medication for the second time.
19	In the same syringe, draw up air equal to amount of prescribed medication to be withdrawn.
20	Insert needle into the vial push the air then invert the vial. Hold it at the eye Level. Be sure that the needle is inside the liquid.
21	Draw the medication prescribed.
22	Withdraw the needle. Recap.
23	Tap gently the syringe barrel with a finger several times to remove air bubbles. Push out the excess air.
24	Check for medication name for the third time. Dispose the vial.
25	Change the needle. Place the syringe in a tray with equipment needed.

Appendix B: Administering intramuscular Injection

#	Procedure
1	Locate and expose the site of Injection. (Dorsogluteal Muscle)
2	Apply clean gloves.
3	Clean the site using circular motion from the center outward about 5cm.
4	Allow skin to dry. Keep a dry cotton between your fingers.
5	Hold the syringe with dart technique (between thumb and forefinger) and uncap the needle.
6	Using Z tract Technique, use the ulnar side of your nondominant hand to pull the skin about 2.5cm to the side, for emaciated pt. pinch the muscle.
7	Insert the needle into the muscle quickly and smoothly at 90º.
8	Support the barrel of the syringe (while pulling the skin) by your nondominant hand, then aspirate. Pull back the plunger for 5 -10 sec.
9	Push plunger inward and inject the medication slowly (1ml per 10sec).
10	After injecting the medication, wait for 10 seconds.
11	Withdraw the needle with steady, smooth, straight way and same angle of insertion.
12	Press on injection site with a dry cotton.
13	Put patient in comfortable position.
14	Discard needle in sharp box. Dispose used equipment.
15	Dispose the gloves.
16	Wash hands.
17	Document.