Clinical and Experimental Health Sciences

Is Standard Urine Bag or Urofix? Which is More Usefull in Surgical Nursing Care? Accuracy of Urine Output Monitoring

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ABSTRACT

Objective: The aim of this study is to evaluate and compare the accuracy of urine output measurement performed by standard urine bags and urofix.

Methods: This is a prospective study conducted at a 22-bed urology unit. Urine volume was measured either by a standard urine bag or urofix, verified by scaled container measurements in patients dressed with urinary catheter and expected to stay with it for 24 hours or more. In total, 1048 measurements were obtained for 131 patients.

Results: The difference between median, maximum and minimum values of urine volumes from the scaled container and nurse's forecast was evaluated for each of 4 measurements. When the urine volume was measured with the standard urine bag, the average volume was 550 cc in the first measurement while it was 300 cc with urofix. Mean values for the second, third and fourth measurements with standard urine bag and urofix were as follows respectively; 590 cc and 335 cc, 500 cc and 300 cc, 600 cc and 300 cc. The difference was statistically significant in all measurements ($p<0.001$).

Conclusion: In this study, urofix was the most reliable method for measuring urine output and fluid management. Furthermore, if the patient has a standard urine bag, it is recommended to confirm the urine output with a scaled container.

Keywords: Urine levels, urine bag, urofix, fluid management

1. INTRODUCTION

Accurate fluid management in patients admitted to the surgical units is still one of the most challenging and important tasks for the surgical team. Intravenous (IV) fluid therapy is given to managing fluid volume shortage/excess, fluid losses, or electrolyte and acid-base imbalances (1). Fluid and electrolyte disorders are seen as the most common clinical problem in the perioperative period. According to the current National Institute for Health and Care Excellence (NICE) guide; The use of "R 5R", which includes "resuscitation, routine care, replacement, redistribution and reassessment" is recommended for parenteral fluid treatments (2).

Surgery can impair fluid and electrolyte balance. These failures may occur in hormonal systems such as hypovolemia, hypotension, renin-angiotensin-aldosterone system and vasopressin and tubular damage. For this reason, influid and electrolyte disorders, diagnosis, fluid management and treatment approaches should be carefully evaluated(3).

While fluid and electrolyte disturbances affect the prognosis significantly, maintenance of balance stands as the main challenge in care and treatment of all patients. Previous perioperative death reports have suggested that most of the serious postoperative morbidity and mortality cases are attributed to fluid imbalance. Therefore, to increase awareness and disseminate good practice among medical and nursing staff training in fluid management is recommended (4). The administration of fluid to restore intravascular volume is a main stay of therapy in preventing Acute Kidney Injury (AKI), although the optimal amount of fluid therapy is unclear. Lopes et al. (5) demonstrated that intraoperative fluid boluses titrated in accordance with the variation in arterial pulse pressure improve postoperative outcomes. Therefore, fluid and electrolyte balance, which entails a careful and perfect practice, mostly means the vital section of patient care for the nursing care. A urine output supports the clinical picture of a patient instable condition;

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therefore, patient fluid input and urine output should be monitored (5). The accuracy of fluid input and urine output records is critical for detecting and preventing hypovolemia, evaluating the amount of fluid and electrolyte requirement in perioperative period (6). Thus, standard urine bag, urofixand scaled containersare important materials. Differences between those materials prevent proper monitoring of urine output leading to an obstacle in detecting hypovolemia, acute renal failure or fluid and electrolyte disturbances and acute therapeutic interventions. In perioperative care, fluid treatment is usually provided by electronic toolssuch as pump devices and the amount of fluid taken is accurately recorded. However, the volume of urine, which is the main component of the fluid output, is measured on an hourly basis and is manually determined and recorded based on the visual assessment of nurses from urofix or urine bags (7). It is important to be a good observer, follow up the patient in a correct and timely manner, and recognize the patients' reactions to the fluid electrolyte imbalance for the nurses giving continuous patient care for 24 hours in order to provide good quality nursing care and to obtain positive patient outcomes (8).

In this study, we aimed to evaluate and compare the accuracy of urine output measurement performed by standard urine bags and urofix.

2. METHODS

2.1 Clinical Setting and Patients

After the acknowledgement by the local ethical committee (Tekirdag Namik Kemal University Non-Invasive Clinical Studies Ethical Board, 2013/57), 131 urology patients who were hospitalized between April and June 2013 and monitored for urine output in University Health and Practice Center enrolled in our study. Patients were included in the sample population if they were older than 18 years old, were hospitalized for at least 24 hours, got urine follow-up, and volunteered to participate in the study. This study is a prospective study conducted at a 22 beds urological unit. Totally 131 urology patients were divided at random into two groups, standard urine bag (n=68) and Urofix(n=63) groups. Overall, accuracy was assessed by comparing each method with the scaled container. A nurse measured urine output four times ina day with standard urine bag, urofix and scaled container. Maximum, minimum and median values for these measurements were calculated. In patients with an urinary catheter and who were expected stay for 24 hours or more, urine volume was measured either by a standard urine bag or by urofix, verified by scaled container measurements. In total, 1048 measurements were obtained for 131 patients (Figure 1).

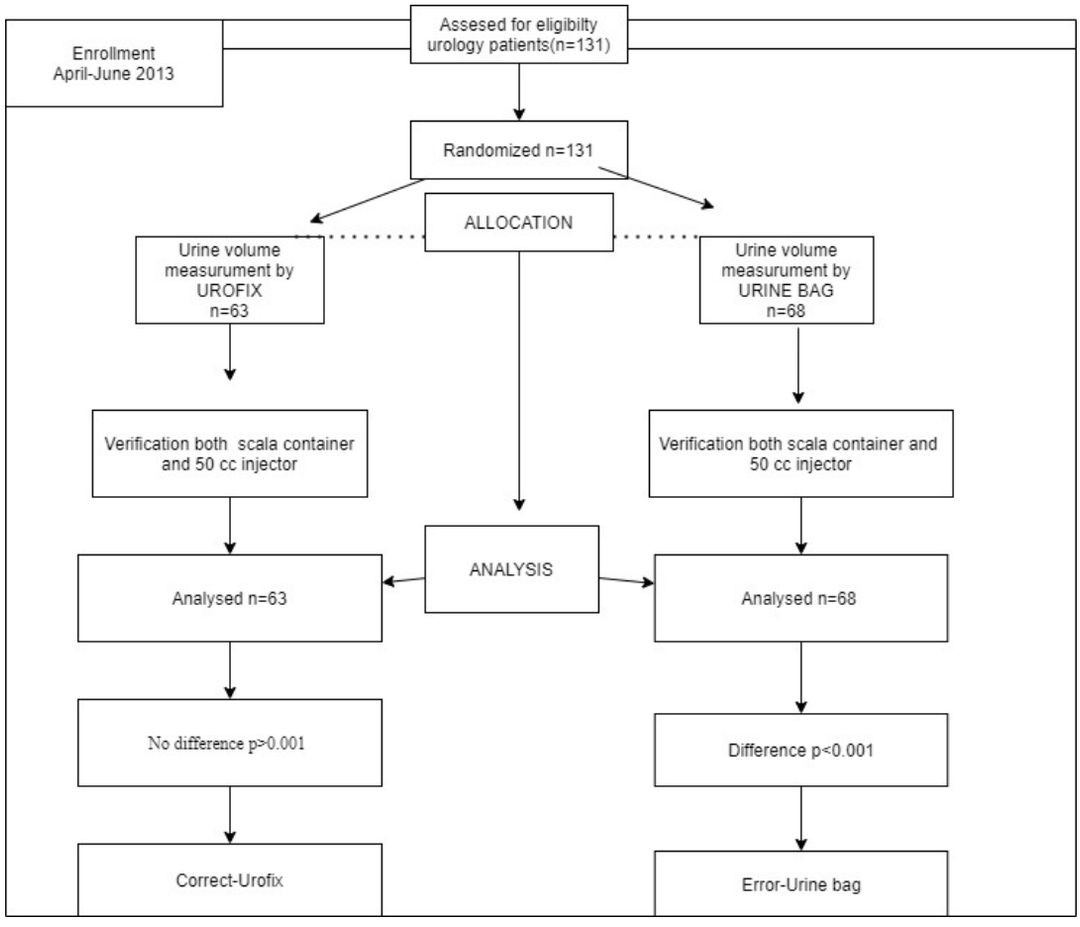

***Figure 1**. Flow Chart of Research*

2.2 Urine Output Monitoring:

Urine output (UO) data of hospitalized patients was gathered via standard 2000 mL urine bag, hourly urine bag (urofix) and scaled container. Monitoring of UO was performed via standard urine bag and urofix, and was measured using a scaled container; and the accuracy of the methods were estimated acoording to the measurements done by the scaled container. Urine output was monitored four times a day with 6 hours intervals, for the patients who were expected to stay for at least 24 hours at the urological unit. The total number of UO data were same for all patients. Evaluation for comparison of three methods was done by 16 nurses. These nurses had been trained for measurements standardization. All nurses were educated for measuring urine output from urine bag and urofix.

When the nurses were asked about the feasibility of the scaled container, it was considered to be better in two aspects:

1. Urofix measurements confirmed the results obtained with scaled container
2. No need to measure with a scaled container once more.

Additionally, the accuracy of the three measurements was evaluated via 50 cc injectors and equivalence of the amount measured by the scaled container and urofix was confirmed by injectors in each sample.

2.3 Statistical Analysis

While evaluating the findings of the study, all analyses were conducted by instutitional statistics program. The convenience of data with normal distribution was assessed with the Shapiro-Wilk test and variance homogeneity was evaluated by using the Levene test. For comparison of two independent groups, the Independent-SamplesT test was used. The twicely repeated analysis of the dependent variables was done by using Wilcoxon Signed Ranks Test with Monte Carlo simulation technique. To compare categorized data with each other PearsonChi-Square and Fisher Exact tests were used again with Monte Carlo simulation technique.

Quantitative data are shown in the tables by mean ± SD (standard deviation) and median (minimum-maximum) values. Categorized data are shown by n (number) and % (percentage) values. Data were evaluated in 95% confidence level and a p-value smaller than0.05 was considered significant.

3. RESULTS

A total of 131 urology patients were randomized to standard urine bag (n=68) and urofix (n=63) groups. Overall accuracy was assessed comparing each method with the scaled container. A nurse evaluated the urine collected in the standard urine bag verified by scaled container measurements. In the same way, urofix measured urine volume was evaluated with a scaled container and verified. The results showed that the difference between median values of urine volumes of the scaled container and the standard urine bag, was statistically significant in all measurements (p<0.001). But there was no statistically significant difference between the urofix and scaled container measurements (p>0.001) (Table 1).

The difference between medianurine volumes from the scaled container and the nurse's forecast (visual estimate) from standard urine bagwas evaluated for each of the 4 measurements. In the first measurement the urine volume was measured as 550 cc with the standard urine bag, and as 300 cc with the scaled container. In the second measurement, it was measured as 590 cc with the standard urine bag, and as 335 cc with the scaled container. In the third measurement, it was measured as 500 cc with the standard urine bag, and as 300 cc with the scaled container. In the fourth measurement, it was measured as 600 cc with the standard urine bag, and as 300 cc with the scaled container. However, when the urine volume was evaluated with the urofix and the scaled container, it was found that there was no difference in the measurements (p>0.05) (Table 1) (Figure 2).

Table 1. *Comparison of urine median, maximum and minimum values of urine volumes obtained by the scaled container and nurse's forecast with urine bag and urofix in 4 measurements.*

	Scaled Container	Nurse's forecast	P Value
	Median (Max.-Min.)	Median (Max.-Min.)	
1. Measurement			
Urine Bag (n:68)	300 (1000 – 50)	550 (2100 – 100)	**<0,001**
Urofix (n:63)	350 (850 – 100)	350 (850 – 100)	1
2. Measurement			
Urine Bag (n:68)	335 (800 – 50)	590 (1550 – 100)	**<0,001**
Urofix (n:63)	350 (750 – 100)	350 (750 – 100)	1
3. Measurement			
Urine Bag (n:68)	300 (1200 – 50)	500 (2000 – 100)	**<0,001**
Urofix (n:63)	350 (850 – 225)	350 (850 – 225)	1
4. Measurement			
Urine Bag (n:68)	300 (1560 – 50)	600 (2000 – 100)	**<0,001**
Urofix (n:63)	400 (850 – 175)	400 (850 – 175)	1

Wilcoxon Signed Ranks Test(Monte Carlo)

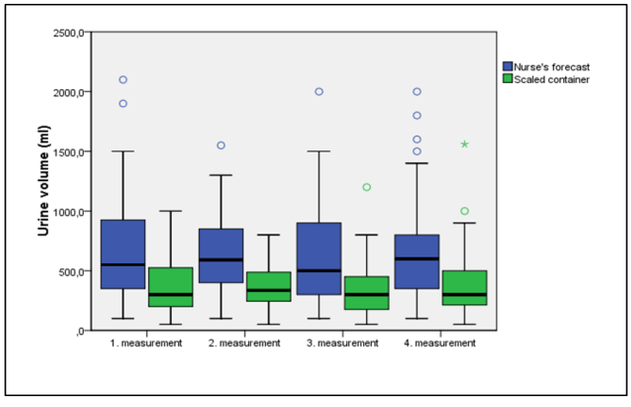

Figure 2. *Comparison of urine volume results by the scaled container and nurse's forecast(urine bag) in 4 measurements*

4. DISCUSSION

Normal fluid balance is impaired by surgery, so proper and adequate fluid management should be part of the management of a patient. Monitoring fluid balance is dynamic and requirements should be calculated perioperatively. The correct assessment of hydration status in critically ill patients is still complex. Fluid and electrolyte disturbances significantly affect prognosis, while maintaining the balance is the main challenge in the care and treatment of all patients.Perioperative haemodynamic optimization using goal-directed fluid therapy (GDFT) has been correlated with improvedpostoperative outcomes following moderate to major risk surgeries (1,9). Urine output is a vital sign for patients. Careful monitoring of UO could lead to a better fluid management. Thus, UO is the main parameter which provides an early alert to impending kidney/organ failure consistently used by medical staff in an already complex care environment (10).

In our study, it was once again determined that monitoring urine output was very important. In the follow-up, the lines on the standard urine bag did not reflect the actual amount of urine by the nurse observation. In the standard urine bag, 550 cc urine output was considered. When the nurse evaluated the lines on the standard urine bag, the patient's urine output was recorded excessively and in fact the patient had less urine output. A statistically significant difference was found between them ($p<0.001$) (Table 1, Figure 2). These measurement errors also indicate that patients may receive incorrect fluid therapy and fluid management. The measurement by urofix was accurate when verifed by scaled container measurement.

Currently, the nurse measures the urine output manually hourly or every 4/6 times a day (11).These tasks must be performed for each patient admitted to the critical care unit 24 times a day, 365 days a year (4). In the hospital setting, patient fluid input is carefully recorded and mostly administered by electronic devices, such as volumetric and syringe infusion pumps. In this same setting, urine volume, the main component of the patient's fluid output, is measured intermittently (on an hourly basis) relying on nurses' visual assessment obtained from urine meters and collection bags. Nowadays the estimated amount of urine is calculated by the simple manual devices. This methods of urine collection demands constant nursing management and handling. Hersch et al. (7) determined that when the amount of urine is measured by the observation of the urine bag, a deviation of urine output was over 130 cc per hour, which is a parallel result with our study.

The measurement of urine with a scaled container or urofix will provide a more accurate calculation of the urine output than the standard urine bag. This error is considerably smaller than the error committed when taking visual measurements, and those committed by other devices proposed to measure urine output (7,12). In fact, interval of once every hour currently employed for UO establishes a compromise between avoiding risk states for the patient and doesn't cause an excessive burden on the nursing staff (7). Sometimes the nurses can not properly close the container valve; thus part of the urine produced during one hour leakes into the plastic bag and is not measured. When this happens, the urine overflows from the graduated container and falls directly into the plastic bag, without being measured.

Our study was carried out in a urologic surgery clinic. It is undeniable that perioperative maintenance is a hardly important issue for the patients. Fluid and electrolyte balance is the fundamental of perioperative and especially postoperative maintenance. In this sense, fluid intake and urine output measurement play the starring role while it predicts any possible imbalance and provides response control for intravenous treatments in case. Therefore, it is recommended to usea scaled container or urofix for the measurement of urine output in order to ensure correct fluid management for the patient.

Limitations of The Study

The sample population included only patients in the wards, furter research is recommended to be done in the intensive care units. Besides, the sample populations ofthis study includes only urology patients. Studies that include other patient populations are also recommended.

5. CONCLUSION

In conclusion, the instruments for urine output measurement is important for the accurate monitoring of urine output. Urofix is more accurate than the standard urine drainage bag in measurement of urine output. Therefore, usage of urofixprovides better monitoring of urine output, which is vital for providing electrolyte-fluid balance in surgical patiens. Urofix may also relieve the nurses' labour, and should be encouraged for clinical studies.

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