ADDIS ABABA UNIVERSITY, COLLEGE OF HEALTH SCIENCE

ASSESSMENT OF CONFIDENCE AND KNOWLEDGE LEVEL OF PERIOPERATIVE FLUID ADMINISTRATION AMONG POST GRADUATE SURGICAL TRAINEES IN TIKUR ANBESSA SPECIALIZED HOSPITAL

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Abstract

Background: Intravenous fluid therapy is an integrated and lifesaving part of the treatment of patients undergoing surgery. It continues to be heavily relied upon in the modern management of general surgical patients, with nearly universal use in the perioperative period.

Objective: The objective of this study was to determine the confidence level of surgical postgraduate residents in prescribing perioperative fluid for the management of patients, whether they feel like they have achieved adequate training in their undergraduate program and if they actually have adequate knowledge regarding this topic.

Method: It was an institution based descriptive cross-sectional study using a self-administered questionnaire. The data was collected using pretested questionnaire, which was used in other researches. The collected data was entered and analyzed using SPSS version 24.

Result: Even though the confidence level for the respondents were no satisfactory there seems to be a slightly elevated degree of confidence level despite a lower level of knowledge. There was a clear preference to use NS for resuscitation with higher level of confidence with less confidence to use potassium supplement. There was also a less than satisfactory knowledge regarding electrolyte requirements of the body and composition of body fluids by the respondents.

Recommendation: A prospective studies about trends of practice would be helpful to have objective data for analysis of adverse outcomes which are attributed to inappropriate prescription of perioperative fluids. After this it would be wise to come up with local guidelines and educational interventions to address perioperative fluid management.

Acknowledgment

First of all I would like to praise almighty God for giving me the gift of a new day to see his blessings and his love for which I will forever be grateful of.

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LISTS OF ACRONMYS and ABBRVATIONS

ASA: American Society of Anesthesiologists

BMI: Body mass index

FMOH: Federal Ministry of Health

ICU: Intensive Care Unit

IV- intravenous

LOS: Length-Of-Stay

NS: Normal saline

RL: Ringer lactate

SPSS: Statistical Package for Social Sciences

TASH: Tikur Anbessa Specialized Hospital

WHO: World health organization

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Chapter 1-Introduction

1.1Background

Total body water for a 75-kg individual is approximately 45 L (60%) from which two-thirds (30 L) is intracellular water. The remaining third (15 L) in the extracellular compartment is divided between the intravascular (3 L) and extravascular (12 L) compartments. The total intravascular volume (or blood volume) is approximately 5 L and has intracellular (red and white cells and platelets: 40% [2 L]) and extracellular (plasma: 60% [3 L]) components.

Very little interstitial fluid is normally in the form of free fluid. Most interstitial water is in chemical association with extracellular proteoglycans, forming a gel. Interstitial fluid pressure is generally thought to be negative (approximately –5mmHg). Increases in extracellular volume are normally proportionately reflected in intravascular and interstitial volume. However, as interstitial fluid volume progressively increases, interstitial pressure also rises and eventually becomes positive. When this occurs, the free fluid in the interstitial gel matrix increases rapidly and results in expansion of the interstitial fluid compartment only. In this way, the interstitial compartment acts as an overflow reservoir for the intravascular compartment, a state seen clinically as tissue edema.

The goal of perioperative intravenous fluid therapy is to maintain or restore circulation with an adequate fluid and electrolyte balance, thereby creating the preconditions for a favorable outcome for the patient. Hence, the goals of perioperative fluid therapy can be summarized as follow.

- Maintain or correct fluid balance(dehydration, Hypovolemia)
- Maintain or correct plasma constitution (electrolytes)
- Secure sufficient circulation (in combination with vasoactive and/or cardioactive substances)
- Secure sufficient oxygen delivery to organs(in combination with oxygen therapy)

Perioperative fluid application basically must replace two kinds of losses:

(1) Losses occurring all the time (mainly urine production and insensible perspiration), possibly to another extent than under "normal" conditions

(2) Losses occurring exclusively during trauma and surgery (mainly blood losses)

The first kind of loss affects the entire extracellular space, i.e., the intravascular plus the interstitial space, and normally does not lead to a loss of colloid osmotic force from the intravascular space. The second loss induces a primarily isolated intravascular deficit, including losses of all blood components. In practice, we only have access to the vascular space, even when treatment of the entire extracellular compartment is intended. [4]

Extracellular losses via urinary output and insensible losses are replaced by absorption of colloid-free fluid and electrolytes from the gastrointestinal system. In the fasted patient, this compensation mechanism fails and has to be imitated artificially by administration of IV fluid. Theoretically, the best solution is an application of crystalloids, ideally in a balanced form, as not to cause acid–base disorders. Because crystalloids are not retained at the vascular barrier after having been infused intravenously, they are homogenously distributed within the extracellular space, i.e., four fifths are distributed into the interstitial space. When substituting acute blood

losses, there is no physiologic correlate we try to imitate, theoretically, an isovolemic online transfusion of warm whole blood should be considered. [4]

1.2. Statement of the problem

Intravenous fluid therapy is an integrated and lifesaving part of the treatment of patients undergoing surgery. Hypovolemia leads to in sufficient circulation with decreased oxygen delivery to organs and peripheral tissues causing organ dysfunction and shock. Fluid overload, on the other hand, leads to interstitial edema and local inflammation and impairs the regeneration of collagen, thereby weakening the tissue healing with increased risk of postoperative wound infections, wound rupture, and anastomotic leakage. Moreover, it causes impaired cardiopulmonary function. It is therefore imperative to administer fluid therapy individually, when needed, and in the right amount. [1]

Intravenous (IV) fluid therapy continues to be heavily relied upon in the modern management of general surgical patients, with nearly universal use in the perioperative period. Perioperative fluid therapy has important beneficial effects on outcome after surgery. Inappropriate fluid management is likely to harm patients, but fluid prescribing practice still varies widely. Prescription of IV therapy is most frequently delegated to junior members of the surgical team but there are no documents regarding whether trainees are trained adequately in prescribing IV fluids or that patients receive appropriate amounts of water and electrolytes in the perioperative period.

Despite the major role of perioperative fluid management on morbidity and mortality of each individual patient the question whether surgical team members are confident enough to prescribe

intravenous fluids and if actually they have got adequate training and have achieved adequate level of knowledge is still not adequately researched area in our setup. We currently have no objective data that addresses issues related with perioperative fluid management. Even though it is part of their daily routine practice we don't know how many of them feel comfortable making these choices regarding the perioperative fluid management.

The perioperative fluid management is usually is not given a due attention in the undergraduate programs. If it also is a neglected area in the postgraduate surgical training programs, it is a question which need adequate attention as it has a major impact on the patients' outcome health care cost. The level of training determines how much of the trainees have adequate knowledge regarding this issue. Their knowledge status will show the quality of patient management in each surgical ward and indirectly the outcomes of patients which is contributed by the right perioperative fluid management.

1.3. SIGNIFICANCE OF THE STUDY

This research was aiming to analyze the gaps among the surgical postgraduate residents with regards to confidence level and knowledge in dealing with perioperative fluid management. According to the previously done researches the outcome of this study was expected to identify gaps in the confidence level and knowledge and practice of use of perioperative fluid. So that after analyzing the deficit areas, we can come up with strategic plan to address current problems in hoping to improve future practice thought educational sessions, guidelines or other methods together with other stake holders.

Chapter 2-Literature review

A study was done in 2010 in UK about Perioperative Fluid Prescription, Complications and Outcomes in Major Elective Open Gastrointestinal Surgery. This study measured perioperative fluid therapy, complication rates and outcomes for major elective open gastrointestinal surgery in a tertiary care hospital. They obtained demographic data, operative details, fluid prescription, complications and outcomes in 100 patients. Perioperative fluid prescription was associated with a positive fluid balance. Complications occurred in 57% of patients with 32% experiencing at least one major complication. Serious complications were substantially more frequent in patients having non-colorectal operations. The most common adverse events were pulmonary edema (21%), ileus (18%), serious sepsis (17%), pneumonia (17%), arrhythmias (14%), delirium (14%) and wound healing problems (infections 13%), anastomotic leaks (12%). Mortality at 30 days was 2% [5].

Another study done on associations of Fluid Amount, Type, and Balance and Acute Kidney Injury in Patients Undergoing Major Surgery was published January 1, 2018 in UK. In this study fluid administration has been reported to be associated with an increased risk of acute kidney injury (AKI). They assessed whether, after correction for fluid balance, amount and chloride content of fluids administered have an independent association with AKI. They performed an observational study in patients after major surgery assessing the independent association of AKI with volume, chloride content and fluid balance, after adjustment for Physiological and Operative Severity Score for enUmeration of mortality and morbidity (POSSUM) score, age, elective versus emergency surgery, and duration of surgery. They studied 542 consecutive patients undergoing major surgery. Of these, 476 patients had renal function tested as part of routine clinical care and

53 patients (11.1%) developed postoperative AKI. They have suggested that for every 5% increase in the proportion of chloride-liberal fluid administered was associated with an 8% increase in the instantaneous hazard of AKI, and a 100 ml increase in mean daily fluid amount given was associated with a 6% increase in the instantaneous hazard of AKI [4].

Also previous researches have showed Undergraduate medical textbooks do not provide adequate information on intravenous fluid therapy. A systematic survey and suggestions for improvement done on February 2014, inappropriate prescribing of intravenous (IV) fluid, particularly 0.9% sodium chloride, causes post-operative complications. Fluid prescription is often left to junior medical staff and is frequently poorly managed. They have remarked that textbooks for undergraduates cover the topic of intravenous therapy poorly, which may partly explain the poor knowledge and performance of junior doctors in this important field. They've suggested systematic revision of current textbooks might improve knowledge and practices. [10]

A research was published in 2014 with a topic of 'Intravenous fluid prescribing knowledge and confidence level among junior physicians in UK' involving 4 teaching hospitals in UK. This study from four medical schools across the UK has confirmed the results of previous regional studies regarding poor knowledge and limited confidence in the prescription of IV fluids among junior doctors. For the question regarding electrolyte requirements of maintenance fluid therapy center 3 21% of respondents knew the right requirement compared with 44% center 2, 88% for center 4 and 88% for center 1. F1 doctors were most confident prescribing normal saline with median score of: 4.0, followed by prescribing a fluid challenge (median: 3.0), and they were least confident in prescribing potassium as part of IV fluid maintenance (median: 3.0).Overall, saline

was chosen for a fluid challenge by 68% of doctors although there were clear differences between the respondents from different centers. [7]

A multi-center questionnaire study done in 2018 in UK demonstrates a persisting lack of understanding relating to the constituents of commonly prescribed intravenous fluids alongside marked heterogeneity in prescribing practice amongst the doctors who prescribe fluids on a daily basis. Clinical grade, workplace and location of undergraduate medical degree were independently associated with level of knowledge and/or rate of fluid prescription in the clinical scenarios, yet formal training in fluid administration did not appear to influence baseline knowledge. They concluded that there is a significant variability in IV fluid prescribing practice, education on this subject is still incomplete and this has a major impact on clinical care. They have recommended improved training and guideline provision should be incorporated into junior doctor rotations to reduce potential impact on patient safety.

Study published in 2014 by a group comprising members of the nutrition support team, surgeons, anesthetists and pharmacists was aiming to measure whether the introduction of a multifaceted, evidence-based, educational intervention will improve both i.v. fluids prescribed by doctors and administrated by nurses. Therefore they produced written local fluid prescribing guidelines and held a series of fluid prescription education sessions for consultants and junior staff. They tried to reduce the overall levels of fluid prescription and to limit normal saline usage in their large teaching hospital since concerns about the over-prescription of perioperative fluids, particularly normal saline, culminated in the publication of UK national guidelines on fluid prescription during and after surgery in the preceding year. [14]

The aim of each educational session was to ensure that attendees should understand why fluid balance was important and when and when not to use 0·9% saline. They were also expected to be able to assess a patient's hydration status and incorporate biochemistry results into effective fluid prescribing rather than simply repeating the previous fluid prescription on a chart handed to them. They were also made aware of the importance of trying whenever possible to prescribe fluid for all their own patients rather than leaving the job for junior doctors.

The education sessions were repeated on several occasions and a formal teaching session on fluid prescribing was incorporated into the surgical junior doctor induction. Repetition and induction teaching were important due to the high turnover rates of junior staff. An important function of the working group was to develop formal local guidelines on perioperative fluid prescribing which were ratified by the drug and therapeutic prescribing committee. The guidelines were posted on the hospital internet and their presence was widely advertised. And a pocket sized portable laminated version of the guidance was given to all junior doctors at the end of fluid education sessions. [14]

The intervention has brought improvements to both the prescription and administration of i.v. fluids in patients managed by colorectal surgeons. It is worth mentioning that the baseline audit identified that less than half of the surgical patients were receiving appropriate maintenance intravenous fluids in sample teaching hospitals. This study has shown that the introduction of an evidence-based, multifaceted, educational intervention on i.v. fluids improved the accuracy of fluid prescription and administration. This improvement related to i.v. Fluid management in both the maintenance and replacement settings. The same improvements were not seen over a similar time period, in the control group where the intervention was not applied.

The data showed that there was a decline in total intravenous fluids prescribed over the first 5 post-operative days from 21·1 liters per patient in 2002 to 14·2 liters per patient in 2009 ($P<0·05$), while pharmacy records showed that the proportion of 0·9% saline supplied declined from 60% to 35% of all fluids supplied to the surgical wards involved, with a concomitant increase in the use of 4%/0·18% dextrose-saline and Hartmann's solution. Alongside these changes in fluid prescribing, the number of patients with clinically apparent edema declined, gut function returned more quickly and the length of stay improved significantly. [14]

Chapter 3: Objective of the study

3.1. General objective

The general objective of this study was to determine the confidence level of surgical trainees in prescribing perioperative fluid for the management of patients, whether they feel like they have achieved adequate training in their postgraduate program and if they actually have adequate knowledge regarding this topic. For this purpose a self-administrative questioners was used taking surgical trainees available in TASH during the study period.

3.2. Specific Objective

1. Assess confidence level of surgical postgraduate residents in dealing with perioperative fluid management
2. Assess their attitude whether the topic of perioperative fluid management was given proper attention during the under and postgraduate programs
3. Assess knowledge regarding the perioperative fluid and electrolyte requirements

Chapter 4: Methodology

4.1. Study area

Tikur Anbessa specialized hospital is multi-specialist tertiary care teaching hospital in Ethiopia, opened since 1972 and, in 1998 transferred to school by FMOH since then it became a university teaching hospital. TASH is now the main teaching hospital for clinical and preclinical trainings of most disciplines. It is also an institution where specialized clinical services that are not available in other public or private institutions are rendered to the whole nation. It has 800 beds, 12 operation theatres, annually 6000-8000 operation done and more than 900 health professionals in the different specialties dedicated to providing health care services, and the various departments' post graduate trainees under specialty training in the school of medicine also provide patient care in the hospital.

4.2. Study design

It was a descriptive cross-sectional study using a self-administered questionnaire. The data was analyzed and cleaned using SPSS 24.0.

4.3. Study period

The study was conducted at Tikur Anbessa specialized Hospital from June 1, 2019 to July 15, 2019.

4.4. Population

The source population for this study was all surgical post graduate residents in Black lion Hospital.

The study subjects are residents that are present at TASH during the study period.

4.5. Sample size determination

The sample size was calculated using the single population proportion formula; since, no related study was found in Ethiopia and Africa

$$n = (Z\ a/2)2 \times p*q / d2$$

$$= \frac{(1.96)2 \times (0.5)\ (0.5)}{(0.05)2} = 384$$

Where: n= number of sample size. Z= desired 95% confidence, Z=1.96.

p = 0.5 maximum population proportion, since no previous studies found.

q =1-p = 1-0.5=0.5 d = is the margin of sampling error tolerated (5%)

$$n_f = \frac{n}{1+\frac{n}{N}}$$

N = Total No of surgical post graduate trainees

n_f = Final sample study

$$\frac{384}{1+\frac{384}{273}} = 160$$

4.6. Inclusion and exclusion criteria

4.6.1 Inclusion criteria

- Surgical post graduate trainees who were present at black lion hospital at the day of data collection and were willing to participate in the study were included in the study.

4.6.2. Exclusion criteria

- Surgical post graduate trainees who were not present at black lion hospital at the day of data collection and/or were not willing to participate in the study were excluded from the study.

4.7. Study variables

Independent variables

- Department,
- year of residency

Dependent variable

- Confidence level
- Knowledge about basic perioperative fluid management

4.9. Operational Definition

Confident: on a one to five scale, someone who scores more than three

Not confident: on a one to five scale, someone who scores less than or equal to three

Agree with a statement: on a one to five scale, someone who scores more than three

Disagree with a statement: a one to five scale, someone who scores less than or equal to three

Resident: post graduate surgical trainee

Junior residents: residents from first and second year

Senior resident: third year and above

Correct answer: the single best answer from the MCQ

4.8. Data collection and management

The self-administered questionnaires were distributed during the weekly teaching days after a support letter from the department of anesthesiology was submitted to the respective departments.

4.9. Data Quality Assurance

The quality of data was warranted through the use of the standardized questioner in English.

4.10. Data processing and analysis

The data was analyzed and recorded on computer using SPSS version 24 data analyzer software.

Percentages (number) were used for Categorical variables.

P-value less than 0.05 was used for chi-square test to declare statistical significance

McNemar test done for association between knowledge and confidence level

4:11 Ethical consideration

After clearance was given by the department of anesthesiology a support letter was submitted to the department of Surgery. Verbal consent was asked before questionnaire was given and confidentiality was protected.

4.12. Dissemination of the Result

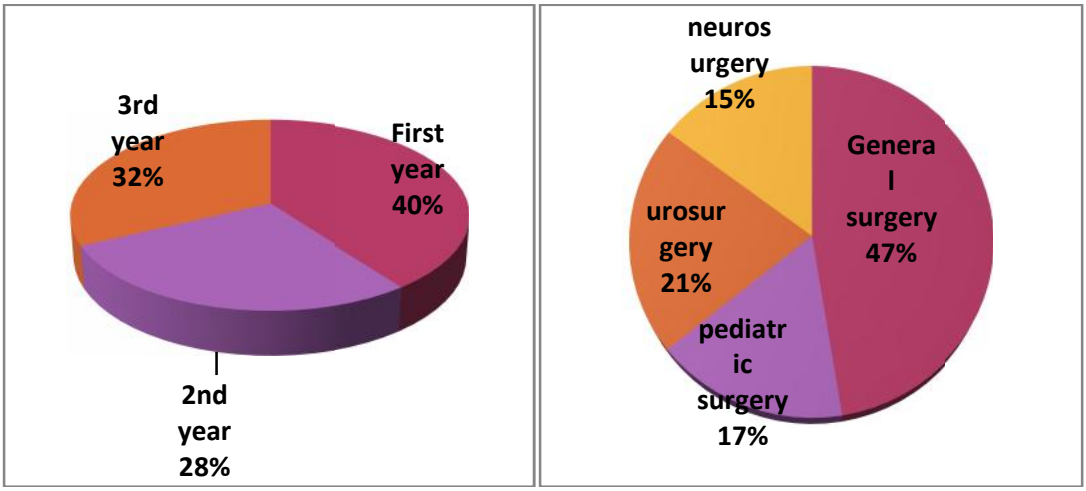
The final result will be disseminated to Addis Ababa university department of Anesthesiology and critical care and Department of surgery.

Chapter 5- Result

A total of 156 residents willingly participated and completed the questionnaire for this study which is a 97.5% response rate. The residents were randomly selected from the units of general surgery, pediatric surgery, urosurgery and neurosurgery using the inclusion and exclusion criteria. From each department respondants were from first year to fifth year post graduate trainees.

		First year	Second year	Third year and above	Total
Department of study	**General surgery**	36	22	16	74
	pediatric surgery	6	8	12	26
	urosurgery	12	9	12	33
	neurosurgery	8	5	10	23
Total		62	44	50	156

Table 1: Department of study * year of residency cross tabtabulation

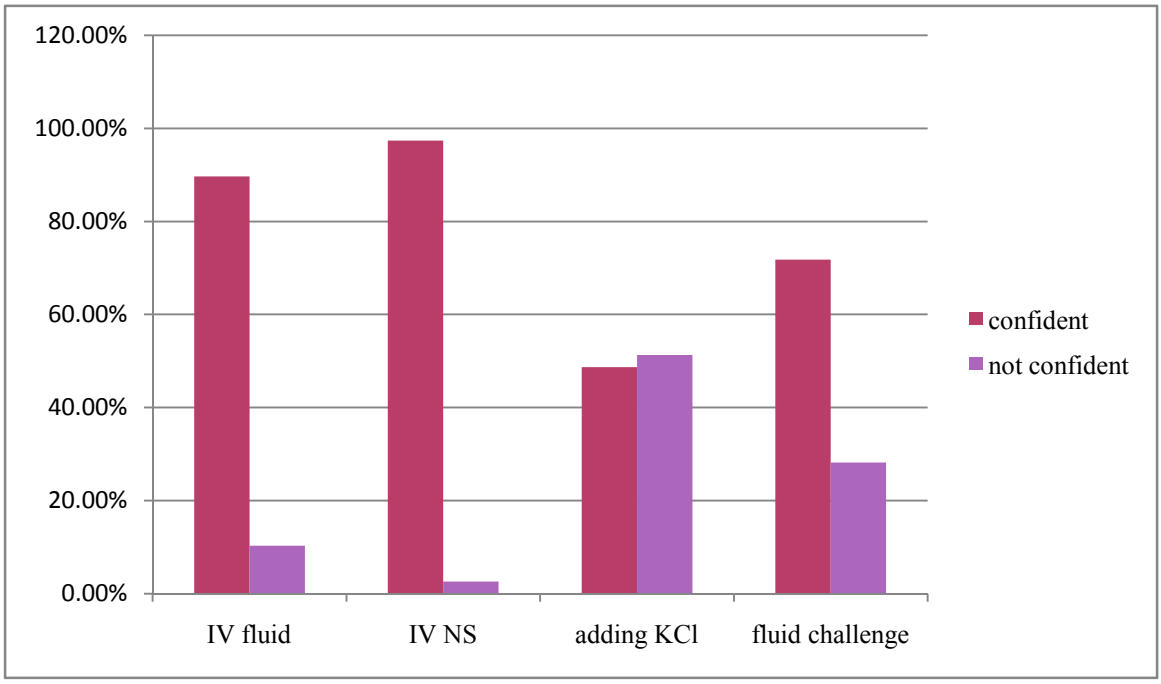


Graph 1: Proportion by Department and Year of Residency

On the self-administered questionnaire it was tried to assess their confidence in prescribing IV fluids, in prescribing normal saline, in adding potassium to a patient's fluid regimen and prescribing fluid challenge to patients. They were asked to rank there comfort level from scale of one to five in ascending order for which a rank of above 3 was taken as confidence in prescribing specific regimen.

Variables	Category	Frequency	Percentage
IV Fluid	Confident	140	89.7
	Not Confident	16	10.3
NS	Confident	152	97.4
	Not Confident	4	2.6
Adding KCl	Confident	76	48.7
	Not Confident	80	51.3
Fluid Challenge	Confident	112	71.8
	Not Confident	44	28.2

Table 2: Summery of Confidence level in prescribing IV fluids, normal saline, in adding potassium to a patient's fluid regimen and prescribing fluid challenge to patients



Graph 2: Summery of Confidence level in prescribing IV fluids, normal saline, in adding potassium to a patient's fluid regimen and prescribing fluid challenge to patients

When we examine the level of confidence in prescribing IV fluid in the perioperative period based on the year of residency, there is a statistically significant difference between the junior and senior residents. The first year residents have shown a statistically significant lower confidence level. (P=0.006)

Year of residency	Confidence in prescribing IV fluid			
	Confident	Not confident	Total	P value
1st year	51 (82.3%)	11(17.7%)	62	0.006
2nd year	40(90.9)	4 (9.1%)	44	
≥3rd year	49(98%)	1(2%)	50	
Total	140(89.7%)	16(10.3%)	156	

Table 3: Confidence in prescribing IV fluid

100% of the 3rd years and above were confident in prescribing NS were as 95.5% of the 2nd year residents and 90.8% of the first year residents were confident. This makes a total of 97.4% respondants which are confident with the use of NS making it the highly ranked variable. However only 58.3% of the residents were able to identify complication of excess NS administration which is Hyperchloraemic metabolic acidosis

Year of residency	Confidence in prescribing NS			
	Not confident	Confident	Total	P value
1st year	2(3.2%)	60(90.8%)	62	>0.05
2nd year	2(4.5%)	42(95.5%)	44	
≥3rd year	0	50(100%)	50	
Total	4(2.6%)	152(97.4%)	156	

Table 4: confidence level in prescribing NS

When we come to the use of KCL supplement in patients' fluid regimen it was identified that more than half of the respondants reported of not being confident which makes it the least ranked variable. It was observed that the third year and above group of respondents have a higher

confidence level compared to the junior residents, however the second year residents scored a less degree of confidence compared to the first year residents.

Year of residency	Confidence in adding KCL to fluid regimen			
	Not confident	Confident		P value
1st year	33(53.2%)	29(46.8%)	62	>0.05
2nd year	25(56.8%)	19(43.2%)	44	
≥3rd year	22(44%)	28(56%)	50	
Total	80(51.3)	76(48.7%)	156	

Table 5: confidence in adding KCl in fluid regimen

Confidence in prescribing fluid challenge is another component from which the junior residents are less confident than senior ones. 71.8% of respondants from the participants were confident in prescribing fluid challenge to a patient with the junior residents having less degree of confidence.

Year of residency	Confidence in prescribing fluid challenge			
	Not confident	Confident	Total	P value
1st year	20(32.3%)	42(67.7%)	62	>0.05
2nd year	12(27.3)	32(72.7)	44	
≥3rd year	12(24%)	38(76%)	50	
Total	44(28.2%)	112(71.8)	156	

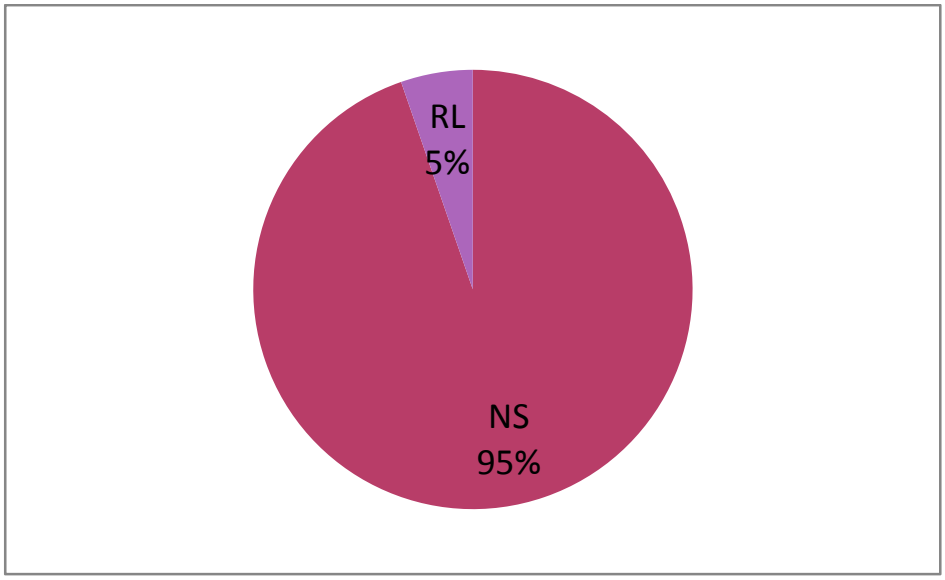
Table 6: Confidence in prescribing fluid challenge

They were also asked to choose their preference of fluid for fluid challenge. This was used to assess the trends for use of normal saline for fluid challenge. 94.9% of the respondents' preferred to use normal saline for fluid challenge whereas the remaining 5.1% preferred to use ringers

lactate. A higher proportion of junior residents preferred to use NS than senior residents (p=0.006).

Year of residency	Choice of fluid challenge			
	Normal saline	Ringer lactate	Total	P value
1st year	60(96.8)	2(3.2%)	62	0.006
2nd year	41(93.2%)	3(6.8%)	44	
≥3rd year	47(90%)	3(10%)	50	
Total	148(94.9%%)	8(5.1%)	156	

Table 7: Year of residency * choice of fluid for fluid challenge Crosstabulation



Graph 3: Choice of fluid for fluid challenge

A total of 53.8% respondents were able to identify that the correct answered for the daily electrolyte requirement of the body is 0.5-1mmol/kg/24hr of potassium and a statistically significant variation among the departments involved. A higher proportion of respondants from

departments of neurosurgery and urosurgery have identified the correct potassium requirement of the body compared to the remaining departments.

Year of residency	Electrolyte requirement		
	Not correct	Correct	Total
1st year	25(67.6%)	37(32.4%)	62
2nd year	27(61.4%)	17(38.6%)	44
≥3rd year	20(40%)	30(60%)	50
Total	72(46.2%)	84(53.8%)	156

Table 8: Correct electrolyte requirement of the body* year of residency

Department of study	Regarding electrolyte requirement			
	Not correct	Correct	Total	P value
General surgery	38(51.4%)	36(58.6%)	74	0.021
Pediatric surgery	16(61.5%)	10(38.5%)	26	
Urosurgery	12(36.4%)	21(63.7%)	33	
Neurosurgery	6(26.1%)	17(73.9%)	23	
Total	72(46.2%)	84(53.8%)	156	

Table 9: Correct electrolyte requirement of the body* department of study

39.7% of the respondents identified that the upper GI loss predominantly contain sodium, hydrogen ions and chloride for which a statistically significant better score was achieved by the respondants from third year and above.

Year of residency	Upper GI loss			
	Not correct	Correct	Total	P value
1st year	41(66.1%)	21(33.9%)	62	0.013
2nd year	31(70.5%)	13(29.5%)	44	
≥3rd year	21(42%)	29(58%)	50	
Total	93(59.6)	63(40.4)	156	

Table 10: Correct constituent of upper GI loss

Only 44.9% of the respondents identified that increased sodium loss in the urine is not associated with antidiuretic hormone secretion in surgical patients. The first year residents have better score compared to others where as a greater proportion of residents from pediatric and urosurgery have identified this.

Year of residency	Regarding ADH			
	Not correct	Correct	Total	P value
1st year	32(51.6%)	30(48.4%)	62	>0.05
2nd year	24(54.5%)	20(45.5)	44	
≥3rd year	30(60%)	20(40%)	50	
Total	86(55.1%)	70(44.9%)	156	

Table 11: Year of residency*Correct use of ADH

65% of the respondents choose that 5% dextrose is not a good choice for fluid challenge, with the first year residents scoring the least confidence level. And on the same note 54.5% from the whole respondants did not identify the complication of excess normal saline administration

which is Hyperchloraemic metabolic acidosis. However 86.7% of the senior residents did identify this complication.

Year of residency	Least preferred fluid for challenge			
	Not correct	Correct	Total	P value
1st year	21(33.9%)	41(66.1%)	62	>0.05
2nd year	19(28%)	25(72%)	44	
≥3rd year	14(28%)	36(72%)	50	
Total	54(34.6%)	102(65.4%)	156	

Table 12: The least preferred fluid for fluid challenge

Overall 9 questions were asked to assess knowledge level among the residents. Five of the questions were dealing with physiology and the remaining 4 were about the IV fluids commonly used. And the results showed a lower degree of knowledge which is surprisingly similar for both junior and senior residents.

Statistics	Total	First year	Second year	3rd year and above
Mean	4.61	4.63	4.2	4.94
IQR	3-6	3-6	3-5	4-6

Table 13: statistics of score of knowledge assessment

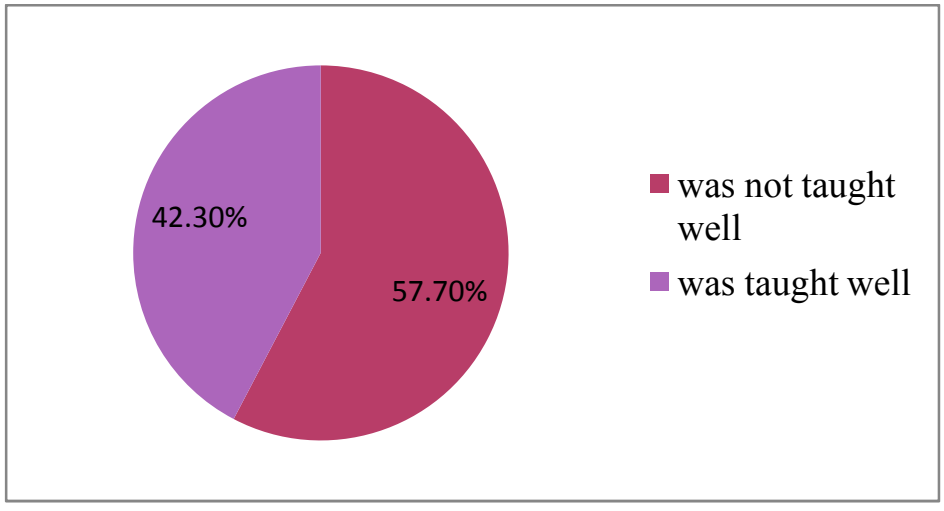
Using McNemar test it was identified knowledge regarding the correct amount of sodium in NS is associated to a higher confidence level ($p > 0.05$) however knowledge regarding complication of excess NS was not associated with higher confidence level. On the other hand knowledge

regarding the right potassium requirement per day is associated with higher level of confidence among the respondents (p> 0.05).

Confidence in prescribing NS	**Na content of NS**	
	Not Correct	Correct
Not confident	2(1.3%)	2(1.3%)
confident	74(47.4%)	78(50.6%)

Table 14: Association between knowledge and confidence level in using NS

From the participants response it was extrapolated that there was variable response for the question regarding how much they agree with the statement "fluid management was taught well in medical school". More than half of the respondants believed that fluid management was not taught well in medical school. 80% of the first year residents disagreed with this statement compared to 57.7 % of the senior residents.



Graph 4: Fluid management in medical school

CHAPTER 6: DISCUSSION

Intravenous fluid therapy is an integrated and lifesaving part of the treatment of patients undergoing surgery. The correct choice of Perioperative fluid therapy has important beneficial effects on outcome after surgery. Even though there is an overall trend towards an over prescription of fluid, both Hypovolemia and hypervolemia have adverse effects on the patient outcome. It is therefore imperative to administer fluid therapy individually, when needed, and in the right amounts.

This study was aimed to identify the confidence level of the physicians who have to deal with perioperative fluid on daily bases. It was used to identify any gaps among the residents to identify intervention points to improve patient outcomes. It is also aimed to minimize the trained of leaving the perioperative fluid management to the junior staff without supervision. The spot test questions were used to assess their knowledge regarding fluid and electrolyte requirements of surgical patients and also the physiology of fluid and electrolyte balance.

As the study showed the confidence of the junior residents in dealing with perioperative fluid management is found to be less ranked than the most senior ones, which is comparative to the other studies done in UK among first year residents. There was a statistically significant lower level of confidence level in prescribing fluid to patients. This supports the fact that 80% of the first year residents disagreed with the statement “Fluid management was taught well in medical school”. This poses a significant problem since majority of the perioperative fluid management is delegated to the junior members of the team.

On the self-administered questionnaire it was tried to assess their confidence level in prescribing in adding potassium to a patient's fluid regimen and 51.3 % of the respondents were not comfortable in adding potassium to patient's maintenance fluid and also 54.5% of the respondents failed to identify the correct amount of potassium required per day. Even though there was no statistically significant association among each group, it was observed that the junior residents have a lesser degree of confidence and knowledge regarding this issue. The lower level of confidence especially might implicate that patients may not be getting the proper potassium supplementation in clinical practice during the perioperative period.

50% of the respondents failed to identify the correct action of ADH in the body. However unlike the other variables the first year residents have identified that increased urinary sodium is not associated with the function of ADH with a greater proportion from departments of pediatric surgery and urosurgery as well. The most important renal action of ADH is to increase the water permeability of the distal tubule, collecting tubule, and collecting duct epithelia of the kidneys. This effect helps the body to conserve water in circumstances such as dehydration. In the perioperative period there is an increase in production of ADH which makes the patients to retain water in this period. Due to this, the current trend of prescribing the same amount of fluid for all patients, and the inadequate understanding regarding how to identify symptoms of state of fluid overload; it is obvious why there is a trend of fluid overload (which is said to be the commonest fluid state in the perioperative period worldwide).

Fluid administration has been reported to be associated with an increased risk of acute kidney injury (AKI). Previous researches have suggested that for every 5% increase in the proportion of chloride-liberal fluid administered was associated with an 8% increase in the instantaneous hazard

of AKI, and a 100 ml increase in mean daily fluid amount given was associated with a 6% increase in the instantaneous hazard of AKI. This study showed majority (around 95%) of the respondents preferred to use normal saline for fluid challenge and 97% respondents were confident in using NS in perioperative period but 58.3% of the respondents did not identify the complication of excess normal saline administered. This is significantly higher proportion of residents to fail to identify complication of excess NS use compared to previous study done among first year residents. On the other hand only 30% of the respondents identified that the upper GI loss predominantly contain sodium, hydrogen ions and chloride which might be interpreted as the preference to use NS is not out of considering patient specific needs.

Previous studies done showed that undergraduate medical textbooks do not provide adequate information on intravenous fluid therapy. For this reason the participants were asked whether they agreed with the statement ‘Fluid management was taught well in medical school’ and 54.5% of the respondants disagreed. Identifying this gap in the teaching curriculum is crucial because a new and better approach has to be sought and implemented to improve the confidence and knowledge level of trainees and improve patient care.

CHAPTER 7: CONCULUSION AND RECOMMENDATION

7.1. Conclusion

Even though the confidence level for the respondents is no satisfactory there seems to be a slightly elevated degree of confidence level despite a lower level of knowledge. It was also identified that normal saline is almost the universal choice among almost all of the trainees with less comfort level in potassium supplementation.

7.2. Recommendation

It would be helpful in the future to do prospective observational studies about the trends of fluid management and incidence of adverse outcomes related to perioperative fluid management. After studying the facts it will be prudent to come up with local guidelines and schedules for educational interventions to improve clinical practice.

7.3. Strength of the study

This study can be used as an entry point for future studies regarding perioperative fluid management and its outcome and also to develop local guidelines.

7.4. Limitation of the study

The study did not analyze other variables which can contribute for the lower level of knowledge and confidence level scored by respondents. Also pre- and postoperative fluid managements and considerations for special groups were not studied separately.

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Annex

Questionnaire

The purpose of this questionnaire is to ascertain how comfortable surgical trainees are in dealing with IV fluid therapy in the perioperative period.

Department _____ Year of residency_____

Please circle your answer below (*1 = not comfortable, 5 = fully comfortable*).

1. How comfortable do you feel in prescribing IV fluids?

1 2 3 4 5

2. How comfortable do you feel in prescribing normal saline?

1 2 3 4 5

3.How comfortable do you feel in adding potassium to a patient's fluid regimen?

1 2 3 4 5

4. How comfortable do you feel in prescribing a fluid challenge to patients?

1 2 3 4 5

5.When prescribing a fluid challenge, what is your fluid of choice?

1. Saline 2. DNS 3.RL 4. D5W

Other (*please specify*): ……

6. How strongly do you agree with the statement: 'Fluid management was taught well in medical school'?

(*1 = disagree, 5 = agree*)

1 2 3 4 5

Spot test

1. Which of the following best reflects electrolyte requirements when dealing with maintenance?
   a) 5–6mmol/kg/24hrs of sodium is required
   b) 0.5–1mmol/kg/24hrs of potassium is required
   c) 20mmol of potassium is the required standard
   d) Twice as much saline to dextrose is generally required
   e) 2L of saline is generally sufficient

2. Which of the following will not contribute to fluid loss in a surgical patient?
   a) Fever
   b) breathing
   c) Urine output
   d) Third space
   e) age

3. Regarding patients with upper gastrointestinal losses…
   a) Nasogastric losses generally have a higher content of potassium than sodium
   b) Losses predominantly contain sodium, hydrogen ions and chloride
   c) When receiving fluids, they generally require more dextrose than saline
   d) Normally, gastric fluid loss is less than 100ml a day
   e) They will rarely require potassium replacement

4. Which of the following is not associated with antidiuretic hormone secretion in surgical patients?
   a) Fall in urine output
   b) Hyponatraemia
   c) Increased urine osmolality
   d) Increased water retention
   e) Increased sodium loss in the urine

5. Which of the following is not associated with fluid overload?
   a) Tachycardia
   b) Hypotension
   c) Elevated jugular venous pressure
   d) Gallop rhythm
   e) Decreased skin turgor

6. Which of the following is least preferred for administering a fluid challenge?

a) 0.9% saline

b) Hartmann's solution

c) 5% dextrose

d) Ringer's lactate

e) Dextrose/saline

7. Which of the following contains the least amount of sodium?

a) 500ml of 0.45% saline

b) 500ml of 0.9% saline

c) 500ml of Hartmann's solution

d) 500ml of Ringer's lactate solution

8. which of the following is a recognized morbidity related to excessive saline administration?

a) Hypochloraemic metabolic alkalosis

b) Hypochloraemic metabolic alkalosis

c) Hyperchloraemic metabolic acidosis

d) Hyperchloraemic metabolic alkalosis

e) Euchloraemic metabolic alkalosis

9. How much sodium is in 500ml of normal saline (0.9%)?

a) 154mmol

b) 150mmol

c) 77mmol

d) 134mmol

e) 67mmol