Bashar Elwir et al, 2020;1(1):020–024.
https://doi.org/10.24911/SJEMED.72-1573218676

ORIGINAL ARTICLE

Intravenous fluid therapy in the non-critically ill patient. Our experience at a tertiary care emergency department in Abu Dhabi

Bashar Elwir[1], Patrick Ukwade[1], Ayesha Almemari[1]*

ABSTRACT

Background: Intravenous (IV) fluids are a commonly prescribed treatment in the emergency department (ED). Often the prescription of a treatment to be administered in the ED prolongs the patients' length of stay (LOS). We hypothesize that IV fluids are overprescribed in the ED, mainly in patients classified as Emergency Severity Index (ESI) triaged level 3 (T3) and level 4 (T4).

Methods: We conducted a quality audit to assess the appropriateness of IV fluid use in adult (age > 16 years) hemodynamically (HD) stable ESI triaged T3 and T4 patients at a tertiary hospital ED during two 6-month periods. Appropriate use of IV fluids was defined from the published literature and our own clinical experience. The primary outcome looked at was the number of patients appropriately prescribed IV fluids before and after implementing a list of indications for IV fluid use in HD stable patients.

Results: Analysis showed 62.8% of T3 triaged patients and 74.2% of T4 patients were inappropriately prescribed IV fluids before the implementation of our indication list. This compared similar to 63.6% of T3 triaged patients and 71.4 % of T4 triaged patients after implementation. Median LOS of patients who received IV fluids was 3.5 and 3 hours for T3 and T4 patients, respectively.

Conclusion: The data obtained in this quality audit demonstrated no difference in the use of IV fluids before and after implementing a list of indications for fluid therapy in HD stable T3 and T4 patients in our ED. We believe that developing a structured education program for caregivers in addition to patient education may help improve utilization of IV fluid based on true clinical indication.

Keywords: Intravenous fluid administration, emergency departments, triage, overcrowding, length of stay.

Background

Intravenous (IV) fluids are a commonly prescribed treatment in the emergency department (ED). Administering IV fluids for hemodynamically (HD) unstable patients is justified, with HD instability defined as abnormal or unstable blood pressure, especially hypotension, or inadequate global or regional perfusion [1]. In addition, IV fluids are appropriately indicated in certain HD stable patients, such as in electrolyte disturbances, migraine headache, hyperemesis gravidarum, acute sickle cell complications, heat exhaustion, and a few other clinical presentations [2]. Administering of treatments including IV fluids may result in increased ED length of stay (LOS) [3,4], which may lead to interruption of the provision of ED services for those who genuinely need them [5]. This adds to the healthcare personnel's workload and added cost to patients and the healthcare system [6,7]. The definition of the appropriate use of IV fluids in ED patients is not very precise in the literature [8]. Indications for prescribing IV fluid are not well described but dwwepend on the clinical assessment of the patient.

Our quality audit was conducted at one of the main EDs in the city of Abu Dhabi, UAE which comprises 42 beds and treats approximately 100,000 patients annually. In

Correspondence to: Ayesha Almemari
*Mafraq Hospital, Abu Dhabi, United Arab Emirates
Email: amemari@seha.ae
Full list of author information is available at the end of the article.
Received: 08 November 2019 | **Accepted:** 19 January 2020

this ED, set of indications to prescribe IV fluids were implemented in June 2016 as part of major ED flow restructuring. Physician staffing level varies between trained emergency physicians with different background training and levels of experience (classified as per UAE professional qualification requirement to specialists and consultants) and general practitioners (GPs), who are not formally trained in emergency medicine. Given the variation in background training, experience level, and cultural preference regarding the use of IV fluids, we hypothesized that there was variability in the prescription of IV fluids in the ED and on a balance of probabilities, IV fluids were likely to be overprescribed in the ED mainly in patients triaged as Emergency Severity Index (ESI) triaged level 3 (T3) and level 4 (T4) [3].

Methods

This was a before and after quality audit to assess IV fluid appropriateness use in HD stable T3 and T4 patients discharged from the ED. We conducted a quality audit and performed a survey of the ED physicians about their IV fluid administration practices in ED. The quality audit included adult (age > 16 years) HD stable patients who were triaged as T3 and T4 on the ESI in ED in two periods; period one was for 6 months prior to implementation of the IV Fluid use indications (from 1st December 2015 to 31st May 2016), and the second period was for 6 months after the implementation of the IV fluid use indications (from 1st July 2017 to 31st December 2017).

For the purpose of this analysis, we reviewed our implemented list of indications for IV fluid administration from the available published literature as well as our own clinical experience based on our case mix and population risk profile in Abu Dhabi (Table 1). The data analysis and definition of appropriateness or non-appropriateness of IV fluids was based on the revised indication list in Table 1 and not on our implemented list.

The survey was beta tested on 6 physicians and was after that sent to 28 physicians working in ED. The survey questionnaire was designed to assess physicians' IV fluid prescribing habits. It sought to evaluate their awareness of the clinical indications for prescribing IV fluids, and assessing factors would might influence their decision to prescribe fluids when they felt there was no clinical indication. In the end, there was a question to assess if the physicians felt a setlist of indications were needed.

Outcomes

The primary outcome looked at was the number of patients prescribed IV fluids before and after implementing a list of indications for fluid therapy in HD stable T3 and T4 patients in our ED. The secondary outcomes we looked at were median LOS of discharged T3 and T4 patients who received IV fluids appropriately and inappropriately and identifying common discharge diagnoses of patients who received IV fluids inappropriately.

Results

For our primary outcome, as outlined in Figures 1 and 2, during the first period of data collection prior to indication implementation (December 1, 2015, through May 31, 2016), we reviewed 339 charts of T3 patients who received IV fluids and were discharged home, of whom 213 (62.8%) received IV fluids inappropriately according to the list of indications identified in Table 1. Table 2 lists the top two indications for the appropriate use of IV fluids in T3 patients.

During the same time frame, we reviewed 62 charts of T4 patients who received IV fluids and were discharged

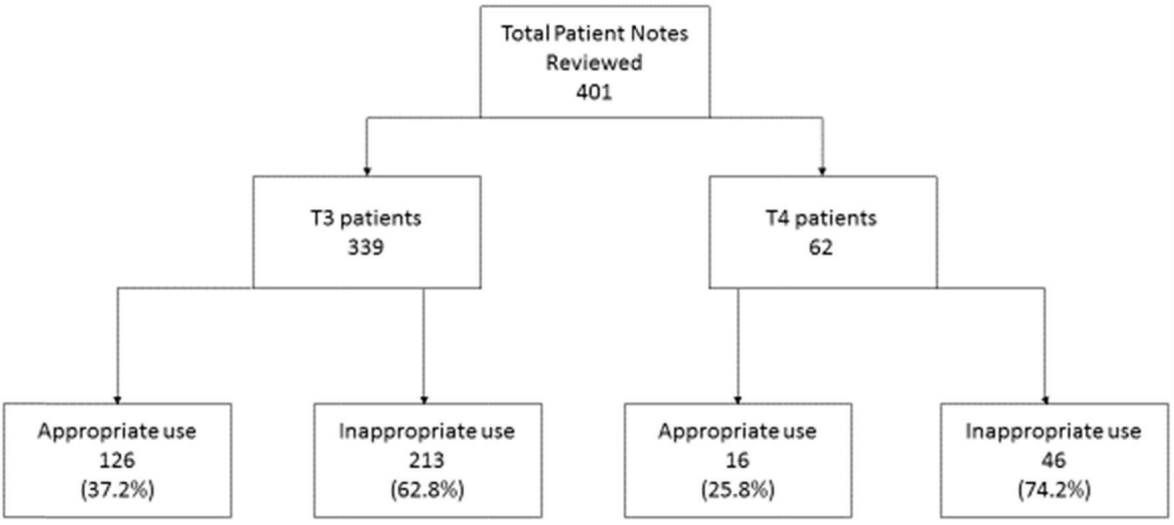

Figure 1. *The first period of data collection (December 1, 2015, through May 31, 2016) patient chart reviewed.*

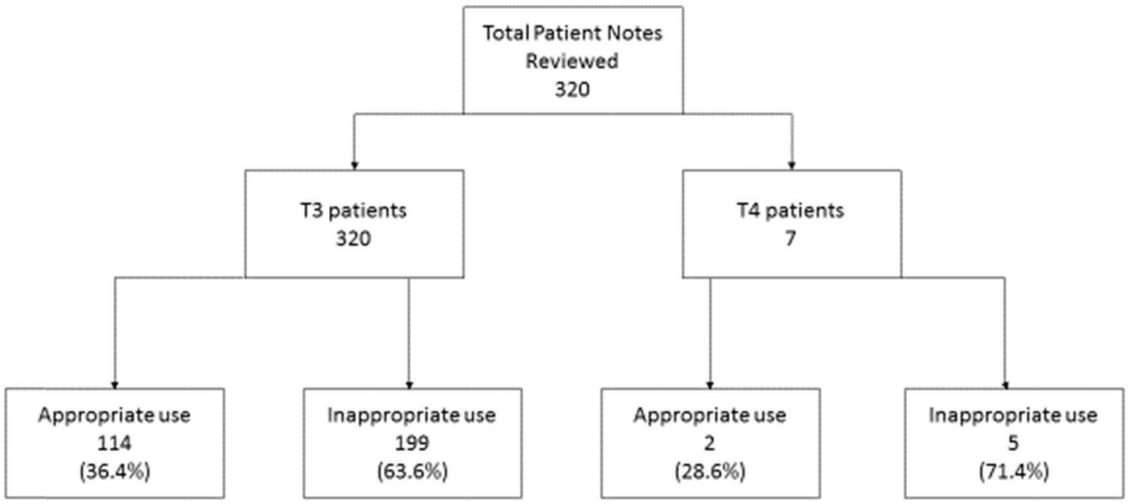

Figure 2. *The second period of data collection (July 1, 2017, through December 31, 2017) patient chart reviewed.*

Table 1. *Proposed list of indications for appropriate use of IV fluids in HD stable T3 and T4 patients in the ED.*

1. Headache
2. Hyperemesis gravidaru
3. Hyperglycemia/hypoglycemia
4. Surgical abdomen (obstruction, appendicitis) in patients who are NPO and may need IV fluids
5. Heat exhaustion
6. Nausea or vomiting with or without diarrhea with signs of moderate or severe dehydration
7. Poor oral intake with signs of moderate or severe dehydration
8. Electrolytes adjustment—not potassium
9. Suspected delirium or psychosis
10. Acute sickle cell complications

Table 2. *Top two discharge diagnoses for appropriate IV fluid use.*

First period of data collection	1. Headache 2. Poor oral intake with signs of moderate or severe dehydration
Second period of data collection	1. Nausea or vomiting with or without diarrhea with signs of moderate or severe dehydration 2. Headache

home, of whom we identified 46 patients (74.2%) who received IV fluids inappropriately according to the list of criteria listed in Table 1. The top two discharge diagnoses in those who received IV fluid appropriately were headache and poor oral intake with signs of moderate or severe dehydration.

During the second period of data collection (July 1, 2017 to December 31, 2017), we reviewed 313 case notes of T3 patients who received IV fluids and were discharged home, of whom we identified 199 patients (63.6%) who received IV fluids inappropriately according to the list of criteria listed in Table 1. During the same time frame, we reviewed seven charts of T4 patients who received IV fluids and were discharged home; of these, we identified two (28.5%) patients with a discharge diagnosis of headache who received IV fluids appropriately according to the list of 10 indications identified above.

The top 10 discharge diagnoses of T3 and T4 patients who were inappropriately prescribed IV fluids for both periods include gastroenteritis without oral challenge, fever, dizziness, vaginal bleeding, vomiting in pregnancy, diarrhea without signs of dehydration, abdominal pain, pharyngitis, gastritis, seizure, and anxiety/hyperventilation. The most three common diagnoses in patients who received IV fluid inappropriately were gastroenteritis with mild dehydration, fever, and dizziness.

Median LOS for the group which received IV fluids appropriately for T3 patients was 213 minutes versus 208 minutes in the inappropriate use group, whereas in the T4 patient group, the median LOS for the appropriate group was 184 minutes versus 173 minutes in the inappropriate use group. We did not evaluate LOS data for the second period given that the rate of IV fluid use was similar in

both periods; therefore, we determined that the first phase reflected both LOS for T3 and T4, particularly because there were not many T4 patients in the second phase.

With respect to physicians' background training and years of experience, we found that IV fluids were prescribed inappropriately by 22% of GPs, 70% of specialists, and 8% of consultants in the first period of the data collection, and the ratio was similar for the second period.

We sent a survey to approximately 28 ED physicians, after two reminders, the response rate was 76%. On questions about appropriateness of IV fluid use, 64% of physicians felt that they were overusing IV fluids, and 77% agreed that a list of indications for the appropriate use of IV fluids is needed in the ED. When physicians were asked about the non-clinical indications that led them to prescribe IV fluids, almost 100% mentioned patient or caregiver preference and expectation.

Discussion

There are no established guidelines on fluid therapy for EDs. Most of what is practiced regarding this are based on extrapolated data from ICU studies. This is potentially misleading as the vast majority of our patients are HD stable and non-critically ill [9]. In addition, diversity in training and physicians' experience practice level might be a contributor with our team and most Middle East EDs are staffed by a mix of consultants, specialists, residents, and GPs. From our practice, we have found that many patients change their opinion if educated about oral hydration and its effectiveness; however, workload pressures may hinder physicians and nurses to effectively educate and persuade patients not to receive therapy that is not indicated. To facilitate appropriate utilization of IV fluids as a treatment when indicated, we established, by consensus, a set of indications for appropriate IV fluid use in the ED in the stable ESI triaged T3 or T4 group of patients (Table 1).

Another major contributor to the inappropriate use of IV fluids as our team survey indicated is attitude and perceptions where patients and relatives believe IV fluids offer nutritional value [10]. Often patients and their caregiver come to ED requesting IV fluids as a "panacea" for all symptoms and the presence of IV fluid therapy is perceived to be a mandatory component of the treatment plan to an extent where staff avoid complaints by prescribing the requested fluid therapy treatment. A study published in Turkey reported that 15.3% of their patient population demanded IV fluids and 2.1% considered going to a different ED to receive them [10]. Most patients in the Turkish study believed that IV fluids were beneficial for the following complaints: lethargy, diarrhea, fever, nausea, and pain. In addition, about half of them felt that IV fluids strengthened their bodies [10].

Our data did not demonstrate that appropriate uses of IV fluid improved after implementing the set criteria listed in Table 1. This failure to bring about change was probably multifactorial. The list of indication implementation was part of 10 different ED flow initiatives all implemented at the same time hence education was general to the overall ED flow process and not to the specific initiatives, therefore, there was no structured education about appropriate IV fluid use indications neither how to negotiate with patients who demand it. In the Middle East, the role of nursing is being developed and the nursing model of care has been outlined in many countries [11]. Part of implementing appropriate IV fluid indications criteria for T3 and T4 patients was to empower the ED nurses to ask the prescribing physician about the indication and to decline giving IV in the minor area and request moving the patient to the major area if felt IV fluid was indicated. This did not happen as nurses were reluctant to confront physicians which we believe is due to the nature of culture-related practice [11].

Overall, a total of 62 ESI triaged T4 patients received IV fluids in the first data collection phase. This compared to seven patients in the second data collection phase, which could correlate to the establishing of a "See and Treat" clinic near the entrance of the ED where the majority of T4 patients were seen and where the physicians and nurses have no access to IV fluids, which confirms the idea that if physicians practice in a setting where there is no access to IVF and they had to move patient to a higher level of care area in order to order the IVF, then it was only ordered when indicated.

When we examined the variability in the appropriate use of IV fluids during the first and second periods of data collection, we found that the most common indications were headache and poor oral intake. Of inappropriate uses, 70% were administered by ED specialists and 18% by GPs. GPs usually cover the two zones in the minor ED area where the majority of T3 patients were seen and where IV fluid administration was restricted to the indications in (Table 1). Although there was no significant difference after implementing the indications for IV fluid use in the minor ED area, we believe that the location of specialist perhaps biased them to prescribe IV fluids inappropriately as they were in the major area where the higher acuity patients are placed. This same reasoning perhaps applies to the significant drop in T4 patients who received IV fluids inappropriately between the first and second phases after the establishment of a "See and Treat clinic" where the physician mindset is to see and treat and would think very carefully before initiating any intervention [12]. Perhaps the physical environment of practice being "see and treat", fast track, minor or major area in ED affect physician's clinical decision-making for IV fluid in this case though may be for other interventions such as investigations [12].

The consultant workforce was the least common prescribers of IV fluids for this cohort of HD stable patients in both periods. This most likely reflects their level of evidence-based practice.

The median LOS of patients who received IV fluids inappropriately was 3.4 and 2.8 hours for T3 and T4 patients, respectively, possibly leading to ED access

issues given that patients are being kept longer than what their care requires. It would be interesting to compare LOS for T3 and T4 patients who received IVF inappropriately and those who did not receive IVF accounting for other variables such as discharge diagnosis, age, and laboratory and diagnostics done.

Limitations of this quality audit were that given resource limitations, the quality audit was done for a short period (6 months before and 6 months after implementation), in addition, it was done in one center hence the result may vary if the list of indications is implemented in another center.

Conclusion

The data obtained in this quality audit demonstrated no difference in the use of IV fluids after the implementation of a list of indications for administering IV fluids in HD stable T3 and T4 patients. The median LOS of patients who received IV fluids inappropriately was similar to those who received IVF appropriately which is likely to affect ED patient flow negatively given that patients are being kept longer than what their care requires. The most three common diagnoses in patients who received IV fluid inappropriately were gastroenteritis with mild dehydration, fever, and dizziness. We believe that developing a structured education program for physicians and nurses in addition to patient education may help improve the utilization of IV fluid therapy as per clinical indication in addition to implementing strategies to limit IV fluid use in certain areas in ED.

List of Abbreviations

ED	Emergency Department
ESI	Emergency Severity Index
GP	General practitioner
HD	Hemodynamically
IV	Intravenous
LOS	Length of stay

Conflict of Interests

The authors declare that they have no competing interests.

Funding

None

Consent for publication

Informed consent was obtained from the patient.

Ethical approval

Our institution does not require ethical approval for quality audits.

Author details

Bashar Elwir[1], Patrick Ukwade[1], Ayesha Almemari[1]
Mafraq Hospital, Abu Dhabi, United Arab Emirates

References

1. Cao H, Eshelman LJ, Nielsen L, Gross BD, Saeed M, Frassica JJ. Hemodynamic instability prediction through continuous multiparameter monitoring in ICU. J Healthcare Eng. 2010;1(4):509–34. https://doi.org/10.1260/2040-2295.1.4.509
2. Jones CW, Gaughan JP, McLean SA. Epidemiology of intravenous fluid use for headache treatment: findings from the National Hospital Ambulatory Medical Care Survey. Am J Emerg Med. 2017;35(5):778–81. https://doi.org/10.1016/j.ajem.2017.01.030
3. Driver BE, Olives TD, Prekker ME, Miner JR, Klein LR. The association of emergency department treatments for hyperglycemia with glucose reduction and emergency department length of stay. J Emerg Med. 2017;53:791–7. https://doi.org/10.1016/j.jemermed.2017.08.068
4. Kocher KE, Meurer WJ, Desmond JS, Nallamothu BK. Effect of testing and treatment on emergency department length of stay using a national database. Acad Emerg Med. 2012;19:525–34. https://doi.org/10.1111/j.1553-2712.2012.01353.x
5. Moskop JC. Nonurgent care in the emergency department – bane or boon? Virtual Mentor. 2010;12(6):476–82. https://doi.org/10.1001/virtualmentor.2010.12.6.pfor1-1006
6. Brim C. A descriptive analysis of the non-urgent use of emergency departments. Nurse Res. 2008;15(3):72–88. https://doi.org/10.7748/nr2008.04.15.3.72.c6458
7. McWilliams A, Tapp H, Barker J, Dulin M. Cost analysis of the use of emergency departments for primary care services in Charlotte, North Carolina. N C Med J. 2011;72(4):265–71.
8. Willis M, Bakir A, Colnetti E, Pott J, Daou A, Gupta A, et al. Peripheral intravenous cannula utilization and frequency of intravenous fluid delivery convenience or necessity? The Royal London Hospital Emergency Department.
9. Harris T, Coats TJ, Elwan MH. Fluid therapy in the emergency department: an expert practice review. Emerg Med J. 2018;35:511–5. https://doi.org/10.1136/emermed-2017-207245
10. Tatli O, Simsek P, Gursoy A, Topbas M, Ozer V, Gunduz A. How important is intravenous fluid administration to patients presenting to the emergency department and to their families? Eurasian J Emerg Med. 2018;17(2):65–70. https://doi.org/10.5152/eajem.2017.83803
11. Behrens S. International nursing: constructing an advanced practice registered nurse practice model in the UAE: using innovation to address cultural implications and challenges in an international enterprise. Nurs Adm Q. 2018;42(1);83–90. https://doi.org/10.1097/NAQ.0000000000000273
12. Hajjaj FM, Salek MS, Basra MK, Finlay AY. Non-clinical influences on clinical decision-making: a major challenge to evidence-based practice. J R Soc Med. 2010;103(5):178–87. https://doi.org/10.1258/jrsm.2010.100104