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Intravenous fluid prescribing: Improving prescribing practices and documentation in line with NICE CG174 guidance

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Abstract

Intravenous (IV) fluid prescribing is a common occurrence in inpatient settings; it has been repeatedly demonstrated that high levels of mortality and morbidity are associated with inappropriate IV fluid prescribing. IV fluid prescriptions are often completed by the most junior and inexperienced members of the clinical team. In recognition of the issues surrounding IV fluid prescribing and in an effort to combat the issues surrounding current practice, the National Institute for Health and Care Excellence (NICE) published guidance in December 2013 - 'Intravenous fluid therapy in adults in hospital (CG174)'. At our hospital the approach to IV fluid prescribing amongst junior doctors was highly variable with poor awareness of the NICE guidance.

We defined necessary components for the documentation of IV fluid prescriptions based upon the NICE guidance. Our initial data showed that these components were infrequently documented, with prescriptions often having no indication for IV fluid, no 24 hour plan / review, no documentation of patient weight or request for further weights, and no current or requested fluid balance charts.

Lanyard cards emphasising the necessary components of an appropriate IV fluid prescription along with a copy of the NICE fluid prescribing algorithm were distributed to junior doctors on the acute admissions units. Following the introduction of the lanyard cards there was a significant increase in the documentation of the defined prescription components. Significant increases in the documentation of indication for IV fluid and patient weight, which are essential components of accurate fluid prescription, were demonstrated on both medical and surgical admissions units. Subsequently, as a result of improved documentation and consideration given to fluid prescriptions, we were able to increase the percentage of maintenance IV fluid prescriptions that conformed to NICE guidelines.

As an endpoint to this intervention all new Foundation Year 1 doctors at our hospital were issued with IV fluid prescribing lanyard cards at Trust induction; the authors believe that this intervention will lead to a unified approach and a sustained improvement in IV fluid prescribing practices and prescription documentation at this hospital site.

Problem

The practice of prescribing IV fluids in hospitals is invariably left to the most junior members of staff, who often lack the experience and knowledge needed to prescribe appropriately. Previous studies have shown that up to 89% of IV fluid prescribing is performed by Foundation Year 1 level doctors.[1] There is a wide variety of prescribing practices among junior doctors, some of which may be secondary to the variability in teaching received at undergraduate level.[2] The lack of standardised national guidelines for IV fluid prescribing in adult inpatients in the United Kingdom can make it challenging for junior doctors to approach the task of IV fluid prescribing in a confident, reasoned, and evidence based manner.

Inappropriate fluid prescribing is a longstanding issue; a 1999 report from the National Confidential Enquiry into Perioperative Deaths (NCEPOD) suggested that up to one in five patients receiving IV fluids in hospital suffered a complication or a degree of morbidity due to inappropriate prescription or administration.[3] Subsequent NCEPOD reports have highlighted that in surgical patients, those who had received inappropriate or excessive IV fluids in the post-operative period had a higher 30 day post-operative mortality.[4] Inappropriate prescription of IV fluids can lead to pulmonary oedema, heart failure, or volume depletion.[5, 6] There are wider issues in terms of prolonged hospital stays and increased cost associated with IV fluid prescribing errors.[7]

NCEPOD has recommended that the practice of IV fluid prescribing should be held in the same regard to that of any drug. The National Institute of Health and Care Excellence (NICE) have attempted to address these issues with the publication of national guidance on IV fluids prescribing in December 2013 - 'Intravenous fluid therapy in adults in hospital (CG174)'.[8]

Background

IV fluids are prescribed frequently to hospital inpatients in both medical and surgical specialties. IV fluid prescriptions can be categorised under three main aims: resuscitation, maintenance, and replacement.

Issues in IV fluid prescribing are likely due to a multitude of factors, including multiple potential indications, high volume of prescriptions performed, variety of fluid formulations available, and variability in undergraduate training. IV fluid prescribing is subjectively reported to receive limited attention during undergraduate medical education

and much of what is practiced by junior doctors is "learnt on the job." This perceived lack of education and training can lead to a culture of inappropriate and poorly planned prescriptions based on a limited knowledge base and poor rational.[9] It is reported that only 16% of surgical consultants feel that junior doctors are appropriately educated in regard to IV fluid prescribing.[10]

It has been observed that IV fluid prescription documentation is often poorly performed. Poor documentation limits the information available to subsequent clinicians, who may be asked to review fluid prescriptions. A clear issue in current practice exists; even if initial IV fluid prescriptions may be appropriate, inappropriate or unnecessary prescriptions may subsequently occur if it is not combined with a clear documented management and review plan. A number of studies and reviews have reported ongoing issues with IV fluid prescribing in inpatient settings; over prescribing of fluids is reported in 17-54% of hospital inpatients, leading to harm in around 50% of these cases.[8]

Several groups have previously developed interventions aimed at improving IV fluid prescribing. However, until recently there were no standardised national guidelines for IV fluid assessment and prescription.[11] The NICE intravenous fluid therapy in adults in hospital (CG174) guidance was introduced in December 2013 to act as a gold standard guide for clinical staff when prescribing IV fluids.

The authors of this paper demonstrated a general lack of awareness of the NICE guidance among junior doctors at a large district general hospital. Staff at this hospital site have highlighted a number of incidents of morbidity and mortality associated with IV fluid prescribing, consequently inspiring this project.

Baseline measurement

We analysed the NICE CG174 guidance and held further discussions with a renal consultant. With their help we developed a set of necessary criteria to be documented in the medical notes when prescribing IV fluids, namely: documented indication for IV fluid, documentation of patient weight, request for twice weekly weights, request for an input / output chart to be commenced at initiation of IV fluids, and a documented 24 hour plan regarding the IV fluid prescription and/or plan for appropriate review.

It was the belief of the authors that if initial prescriptions were rational, standardised, and well documented then this would increase the likelihood that subsequent prescriptions would be appropriate. Accurate initial prescriptions and documentation provides sufficient information upon which subsequent prescriptions can be based. For this reason, the focus was on improving prescribing practice and documentation in the acute admissions units, where many IV fluid prescriptions are initiated.

Baseline data were collected on the two acute admission units; medical emergency assessment unit (MEAU) and the surgical emergency admissions unit (SEAU). Forty-six and 29 sets of baseline data were collected for patients in MEAU and SEAU respectively. Between two and five patients notes were selected at random each day over a two-week period. Data were recorded from all available documentation, including medical and nursing notes and prescription charts; no attempts to discuss cases with prescribers were made. Cases where IV fluid prescribing was part of a "treatment bundle" or algorithm were excluded from the analysis, such as DKA protocol or Sepsis Six bundle.

MEAU baseline data: documentation of indication in 62% of cases (n = 28), documented 24 hour plan and/or documented time for review in 33% of cases (n = 15), weights recorded in the medical notes in 4.2% of cases (n = 2), twice weekly weights were only requested on a single occasion 2.1% (n = 1). Input / output charts were requested in 17% of cases (n = 8).

SEAU baseline data: documentation of indication in 34.5% (n = 10) of cases, no cases (n = 0) had a 24 hour plan and/or review documented, no cases (n = 0) had a weight documented in the medical notes, no cases (n=0) had a documented request for twice weekly weights. Input / output charts were requested in 17.2% (n = 5) of cases.

Design

The baseline data demonstrated that when junior doctors were prescribing IV fluids, infrequently those criteria that are defined as necessary for an appropriate IV fluid prescription were not being documented. More often than not, prescriptions were prescribed without documented consideration of patient body weight.

It was initially felt that the most suitable intervention would be to develop posters highlighting the NICE guidance and defined criteria for IV fluid prescription documentation, and to then place these in the clinical areas where juniors doctors on acute admissions units were most likely to see them. The posters were presented at the medical grand round and a surgical audit meeting. The presentations were well received but generally poorly attended by junior doctors, which limited their potential impact. Discussions with junior doctors highlighted that the high volume of literature on the walls in MEAU and SEAU and the busy nature of the wards had limited junior doctors awareness of the posters.

Two ideas were proposed to allow the junior doctors to be able to access the relevant information more readily and at times when they were likely to be prescribing IV fluids: an IV prescription sticker and a lanyard card (see figure 1). The two options were discussed at the medical grand round. The idea of a prescription sticker was poorly received by many senior clinicians as it was felt this would act to deskill junior doctors with further concerns about physical availability and compliance. A lanyard card containing a section on the defined prescribing criteria for IV fluids and an amended algorithm of the NICE guidance was well received. Lanyard cards have previously been shown to increase knowledge among junior doctors.[12]

Prior to the introduction of the cards, a questionnaire was distributed to junior doctors at a teaching session on IV fluid management. The questionnaire results showed that junior doctors considered a vast and inconsistent range of factors when prescribing, many of which lacked an evidence base or clear

methodology. Doctors stated they rarely documented the aims and objectives of their prescription. Many junior doctors stated they did not use the patient weight to accurately calculate a prescription and many were unsure of how to do this. There was a general lack of awareness of the NICE recommendation regarding weight calculated prescribing. Junior doctors reported that it was uncommon for them to set a formal review point for their prescriptions.

Strategy

PDSA cycle 1:

Following initial data collection a poster of prescribing guidance and the NICE IV fluid algorithm was displayed in several locations around the nurses stations in the acute admissions areas. The posters and their content were presented at the medical grand round and surgical audit meeting. Junior doctor attendance at these events was generally poor. Discussions with junior doctors following this highlighted that overall awareness of the posters and their content was poor due to poor attendance at these events.

PDSA cycle 2:

A teaching session to foundation year doctors was conducted and a questionnaire to assess current prescribing habits was distributed to junior doctors. Questionnaire feedback showed that junior doctors were frequently prescribing with limited planning with poorly defined aims and objectives for their prescriptions. The majority of junior doctors were not formally calculating prescriptions based on patient weight. Junior doctors reported that it was uncommon for them to set a formal review point for their prescriptions. This cycle demonstrated that the issues identified in the initial audit were due to both poor understanding of IV fluid prescription and current NICE guidance as well as a medical documentation issue.

PDSA cycle 3:

IV fluid prescribing lanyard cards were produced. The cards detailed the essential documentation to accompany IV fluid prescriptions and an amended version of the NICE fluid prescribing algorithm. The cards were handed to all junior doctors working on the acute admission units (ie MEAU and SEAU). Two weeks following introduction a re-audit of notes in MEAU and SEAU was performed.

PDSA cycle 4:

Introduction of the lanyard cards demonstrated benefits in terms of improved documentation and management plans. Feedback from junior and senior staff alike was overwhelmingly positive. The cards were approved for distribution to all Foundation Year 1 doctors commencing their posts in August 2014. The cards were distributed following a teaching session on the NICE guidance and inpatient IV fluid management.

Results

Thirty-two junior doctors (F1-CT2) were included in an initial questionnaire based survey of current prescribing practices. Forty-seven percent of participants stated they would prescribe maintenance fluids of 3 litres per 24 hours to an “average” 70 kg patient (NICE guidance would recommend 2.1 litres based on this patient weight); only 15% stated they calculated maintenance fluids using patient weight.

A re-audit of prescribing practice was performed two weeks following introduction of the lanyard cards. Between three and five patient notes were selected at random each day, with a total of 44 from MEAU and 23 from SEAU over the two-week period.

SEAU data showed significant improvement in all five areas of documentation criteria (See figure 2). A score of one was given for each IV fluid prescribing criteria that was requested out of a possible five (See figures 2 and 3).

- Documentation of indication for fluid increased from 34.4% to 82.6% of prescriptions (p=<0.01)

- Documentation of patient weight increased from 0% to 34.7% (p=<0.01)

- Documentation of 24 hour management plan and/or review time increased from 0% to 34.7% (p=<0.01)

- Requests for twice weekly weights increased from 0% to 26.1% (p=<0.01)

- Requests for input / output charts increased from 17.2% to 56.5% of patients (p=<0.01)

MEAU data showed significant improvement in three areas of documentation (see figure 3).

- Documentation of indication for fluid increased from 60.9% to 84.1% of prescriptions (p=<0.01)

- Documentation of patient weight increased from 4.3% to 22.7% (p=<0.01)

- Requests for twice weekly weights increased from 2.2% to 29.5% (p=<0.001)

- Documentation of twenty-four hour management plan and / or review time showed a none significant reduction from 32.6% to 29.5% (p=0.38)

- Requests for input / output charts showed a none significant increase from 17.39% to 27.3% of prescriptions (p=0.13).

Combined pre- and post-intervention results are demonstrated in figure 4.

Indirectly as a result of emphasis being placed on the prescription of IV fluids the average rate of fluid within a 24 hour period was brought down and to within NICE guidelines from 35.9 to 27.6

mls/Kg/day (p=<0.05).

See supplementary file: ds4065.pptx - “IV Fluid Prescribing Figures 1-4”

Lessons and limitations

There were difficulties ensuring all junior doctors on the admissions units were aware of the intervention and received the lanyard cards due to the frequent turnover of doctors on the admissions units. Boxes of lanyard cards were made available on the wards to maximise uptake.

There was significant support from senior clinicians for the project, many of whom felt that IV fluid prescribing was performed sub-optimally by many junior doctors. There was a clear intention not to "spoon feed" information or develop implementations that may deskill trainees. The intervention was designed to educate and change the attitude and approach to prescribing, as opposed to "forcing" juniors to prescribe a certain way. By improving the knowledge base of trainee doctors in regard to prescribing IV fluids by weight meant that patients indirectly received more appropriate and individualised regimens. We demonstrated that many of our patients required far less fluids than they were often prescribed. By highlighting the need for prescribers to acknowledge patient weight we were able to demonstrate that post intervention the average daily fluid volume prescribed met the 25-30 mls/kg/day range stipulated in the NICE guidance.

All new Foundation Year 1 doctors were given a lecture on IV fluid prescribing and were provided with lanyard cards at the junior doctor induction event. Early intervention in this group should reduce the formation of poor habits and encourage a cohort of junior doctors to adopt an unified approach to IV fluid prescribing and documentation. It is hoped that these junior doctors will develop a positive culture in this hospital and improve the wider prescribing practices of their colleagues. The intention is to distribute the lanyard cards to further hospital sites within the deanery and implement them at future junior doctor induction events.

The intervention has very little cost, with each card produced in-house by the postgraduate medical education department. Hospital buildings were used for all meetings and teaching sessions. This simple approach has allowed for a sufficient number of lanyard cards to be produced at negligible cost, therefore there should be little financial hurdle to producing further cards for distribution to junior doctors and medical students.

Conclusion

We have demonstrated that prescription and documentation of IV fluid by junior doctors is highly variable and that there is generally poor awareness of current NICE IV fluid guidance amongst junior doctors. IV fluid prescriptions frequently lack clearly documented management plans or review dates. We have demonstrated that a simple intervention in the form of a lanyard card with prescription documentation advice and a prescribing algorithm has improved prescribing documentation and the use of patient weight when planning IV fluid prescriptions. This intervention has been distributed to incoming Foundation Year 1 doctors and it is anticipated that this will improve overall prescribing practices and continue to show sustained improvement. The ultimate aim of this intervention is to reduce morbidity and mortality associated with IV fluid prescribing.

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Declaration of interests

Nothing to declare.

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