Results

313 patients participated in this audit over a total period of 8 weeks, (*n* = 171 patients pre-hydrant over 4 weeks, and *n* = 142 patients during hydrant implementation over period 4 weeks), from three wards who participated within this study (one orthopaedic and trauma ward, one surgical ward and one urology ward). The mean age of patient participants before hydrant implementation was 72, and during hydrant implementation was 69.

Following a descriptive analysis (*appendix 17*), the maximum total LOS pre-hydrant was higher (*n* = 41) compared to hydrant implementation (*n* = 33). The total number of days fluid monitoring (FM) was also reduced from pre-hydrant (*n* = 39) compared to hydrant implementation (*n* = 31). The results are summarised in *Table 6*.

Table 6 – Maximum total number of days before FM, maximum total number of days FM, maximum total number of days from stop date of FM and discharge, and maximum total LOS, pre and post hydrant implementation on 3 specialist wards

	Maximum total number of days before FM	Maximum total number of days FM	Maximum total number of days from stop date of FM until discharge	Maximum total LOS
Pre- hydrant	5	39	19	41
Post- hydrant	0	31	8	33

KEY

FM = fluid monitoring
LOS = length of stay

The Mann-Whitney *U* test (*appendix* 20*)* reveals significant differences for *total length of stay* before hydrant implementation (*M* = 183, *n* = 171) compared to hydrant implementation (*M* = 125, *n* = 142) *U* = 7655, *z* = -5.64, *p* <0.05. And for *total length of fluid monitoring* pre hydrant (*M* = 175, *n* = 171) and during hydrant implementation (*M* = 135, *n* = 142) *U* = 8990, *z* = -3.96, *p* <0.05.

Frequency analysis (*appendix 18),* identifies than *n = 28 patients were* diagnosed with infections during admission and *n* = 142 patients were not, prior to hydrant implementation, and standard water jugs were used. During hydrant implementation *n* = 0 patients were diagnosed with infection, where water jugs were not used. 8 types of infections were diagnosed *before* and *during* admission, before the hydrant was implemented, which included wound, urine, sepsis, joint, knee, pneumonia, chest and hip infections. Urine infections were most frequent (*n* = 18), taking up a total of 58.1% of the total infections diagnosed.

18.1 % (*n* = 31) of patients became dehydrated during their admission before hydrant implementation, and 0.7% (*n* = 1) patients became dehydrated during hydrant implementation during admission. Following hydrant implementation, the number of patients who required assistance with fluids was reduced (*n* = 37), compared to before the hydrant was implemented (*n* = 48).

Of the 31 patients who became dehydrated prior to hydrant implementation *n* = 21 patients developed an infection during their admission, suggesting that there is a relationship between lack of hydration and the cause for infection.

The results from the frequency analysis are summarised in *Table 7*. These results suggests the hydrant was effective for a variety of semi-dependent/dependent patients as well as independent patients, and perhaps assisted with reducing dehydration and infections among patients who were fluid balance monitored. An increase in clinical staffs' awareness of hydration, and the power-point presentation on how to fluid balance monitor correctly, may have also contributed to these results.

Table 7 – Total number of patients who became dehydrated and developed infections during admission, before and during hydrant implementation across 3 specialist wards

	Assistance required with fluids	Dehydrated during admission	Infection during admission
Pre-hydrant	48	31	28
Post-hydrant	37	1	0

A further Mann-Whitney *U* test (*appendix 20*) identifies differences between the age of patients who become dehydrated during admission (*Md* = 84*, n* = 31), *U* = 3496, *z* = -3.3, *p* <0.05 and the age of patients who developed an infection during admission (*Md* = 81, *n* = 28), *U* = 1296, *z* = -2.95, *p* <0.05 prior to hydrant implementation.

A chi-Square test (*appendix 21*), identifies the differences between the pre and post hydrant implementation data, for patients who developed infection and became dehydrated during their hospital admission, for all the 3 wards individually. Ward 1, surgery (1, n = 65) = .00, p <0.01. Ward 2, urology (1, n = 102) = .00, p <0.01. Ward 3, orthopaedics and trauma (1, n = 146) = .00, p = <0.01. *Table 8 summarises* the frequencies of infections and dehydration for the individual wards, before and during hydrant implementation. Ward one (orthopaedic and trauma ward) was identified to have had the highest frequencies for infection and dehydration, compared to the urology and surgical ward before hydrant implementation.

Table 8 – Infection and dehydration rates for individual wards diagnosed during admission before and during hydrant implementation

		Orthopaedic & Trauma	Urology	Surgery	Total
Pre	Infection	18	5	5	28
Post	Infection	0	0	0	0
Pre	Dehydration	17	9	5	31
Post	Dehydration	0	0	1	1

KEY

Pre = before hydrant implementation
Post = during hydrant implementation

During the first stage of this study, a total of 23 questionnaires were received back from nurses and healthcare assistants across the 3 wards, aimed at assessing their knowledge of hydration (*appendix 22*). Clinical staff demonstrated variations with their levels of knowledge (summarised in *table 9*). Staff appear to be able to demonstrate an awareness of the basic signs of dehydration (question 1), as well as a basic understanding of water and

physiology on the body (question 2, 3, 6, 9 and 10). However, areas of knowledge that appeared to be lacking, included benefits of hydration (question 11) and why patients needed to drink more during their hospital admission (question 12). 56.6% of staff were able to identify ideas for improving their fluid balance monitoring within their own clinical areas (question 13), as well as 69.6% staff being able to identify how to possibly encourage their patients to drink more during their hospital admission (question 14).

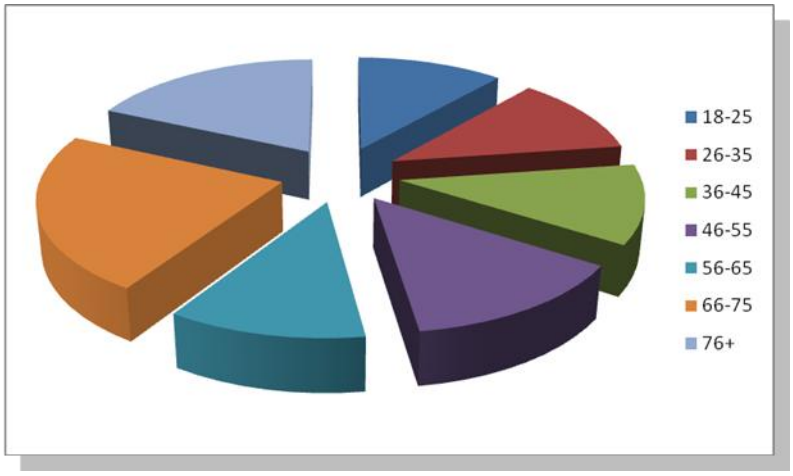
Table 9 – Staff questionnaire results following assessment of knowledge of hydration

Question	Total number of staff with correct answers	Total number of staff with incorrect/incomplete answers	Percentage Staff with correct answers
1. Please list at least ten signs of dehydration	18	5	78.3%
2. What is the chemical name for water?	21	2	91.3%
3. What percentage of our body is made up of water?	18	5	78.3%
4. Does water contain: fats/proteins/carbohydrates/ calories?	7	16	30.4%
5. What nutrient can slow down water absorbed in the stomach?	2	21	8.7 %
6. How much water does breathing in and out use each day? Pint/glass/bath?	14	9	60.9%
7. How long can out bodies live without water?	3	20	13%
8. How may patients become dehydrated?	6	17	26.1%
9. What colour should patients' urine be if they are well hydrated?	20	3	86.9%
10. What complications can patients develop from dehydration?	11	12	48%
11. What are the benefits of good hydration?	8	15	34.8
12. Why do patients who are admitted to hospital need to drink more?	6	17	26.1%

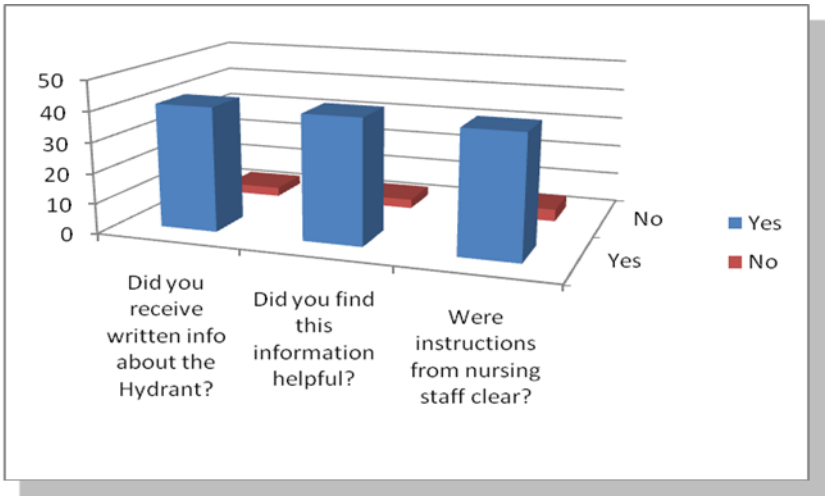
13. How could you improve your patients' fluid monitoring on the ward?	13	10	56.5%
14. How could you encourage your patients to drink more in hospital?	16	7	69.6%

44 questionnaires (*appendix 23*) were received back from patients (following implementation of the hydrant), of various ages as identified in *Graph 1* with the largest group being 66-75 year olds (*n* = 10). *Graph 2* identifies that the majority of the patients found instructions from nursing staff on how to use the hydrant clear (*n* = 40), with the written information provided easy to understand and follow (*n* = 41).

Graph 1 - Age groups of patients who used the hydrant

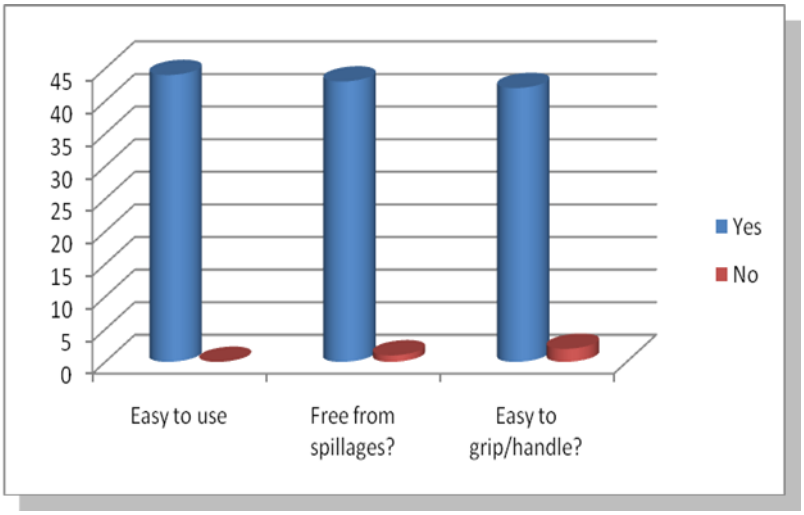


Graph 2 – How clear were the written and verbal instructions for the hydrant?

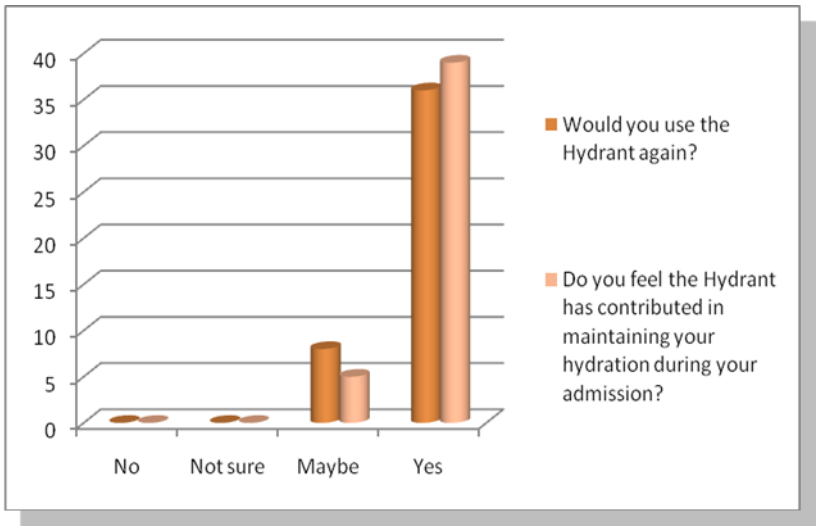


Graph 3 shows all of the patients found the hydrant easy to use (*n* = 44), with the majority of the patients finding the grip was easy to hold (*n* = 42) and was free from spillages (*n* = 43). This suggests the hydrant was an effective tool for various groups of patients to drink from.

Graph 3 - How easy did you find the hydrant to use?



Graph 4 - How effective did you find the hydrant? Would you use it again?



Graph 4 indicates that nearly all of the patients who completed a questionnaire would use the hydrant again (*n* = 36 yes and *n* = 8 maybe). Most of the patients (*n* = 39) felt confident that the hydrant assisted with their hydration maintenance during their admission.

Table 10 summarises how patients thought the hydrant could be improved, and their over - all comments from the questionniares following its use.

Table 10 – Patient comments following use of the hydrant and how the hydrant could be improved

How could the hydrant be improved?	Comments
- Different colours - Bigger bottle - Easy change mouth piece - No improvement required - More accurate measuring - Be good for the gym - Should be available for all patients	- Would be good for the gym - Felt confident with nursing staff - Reassuring - Brilliant idea - Great thank you - Made my stay in bed bearable - Excellent product - Should be available on all wards

	- No hassle to get a drink - Drink on tap - Like a sports bottle and better looking than a jug - Easy for staff to monitor what I am drinking - Comfortable bottle

A total of 33 questionnaires were received back from staff (*appendix 25*). 43% received were from nurses, 42% healthcare assistants and 15% from other healthcare professionals (i.e. ward clerks, doctors etc).

The majority of clinical staff stated they were happy with the training received prior to hydrant implementation (*n* = 26). Only a few members of staff stated they were not (*n* = 7). G*raph 5* identifies that the majority of staff found the hydrant easy to assemble and use, with clear instructions given. It was also identified how effective the hydrant was for their patients, reducing their time and enabled more accurate fluid balance monitoring.

GRAPH 5 - How easy did you find the hydrant to assemble? Did you find if effective for patients to use?

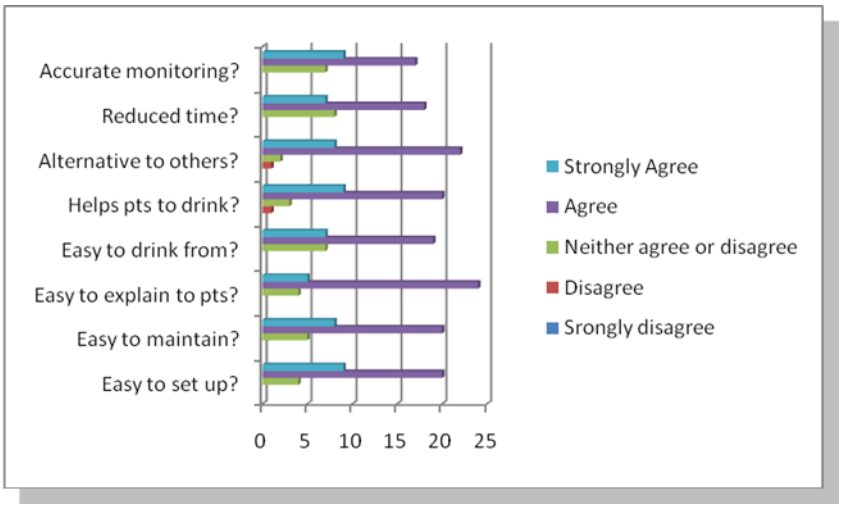


Table 11 summarises the positive comments on the questionnaires, received from clinical staff following the implementation of the hydrant with their patients.

Table 11 – Comments received from the clinical staff questionnaires following the use of the hydrant with their patients

Comments
- I believe the hydrant is a very good idea - Very useful for accurate fluid balance monitoring - Name on patient bottles please - Child friendly - Different colours would be nice - Saves me time in helping my patients to drink, thank you - Good for accurate fluid balance monitoring - Useful tool, made me confident my patients are drinking - Bigger bottle please - Saves me asking patients how much they have had to drink - More accurate numbers on bottle please - Excellent - All patients should have one

Results of a fluid balance chart audit carried out on all 3 individual wards, (*appendix 25*) before and during hydrant implementation, is summarised in *graph 6* (Ward 1 is a large ward separated into three individual areas).

The graph summarises a clear improvement following hydrant implementation for all specialities. The surgical ward showed the most significant improvement from 33% to 51% during hydrant implementation. The power-point presentation of correct fluid balance

monitoring, given to staff during 2nd stage of this study, may have contributed to the identified improvements of the fluid balance chart documentation observed.

Graph 6 - Fluid balance chart audit results for individual wards before and during hydrant implementation