Supplementary material

Reducing urinary catheter use using an electronic reminder system in hospitalised patients: a randomised stepped wedge trial

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# Figure S1. Study design

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Ward** | **1 month** | **2 months** | **3 months** | **4 months** | **5 months** | **6 months** |
| **A + B** |  |  |  |  |  |  |
| **C + D** |  |  |  |  |  |  |
| **E + F** |  |  |  |  |  |  |
| **G + H** |  |  |  |  |  |  |
| **I+ J** |  |  |  |  |  |  |

Note: Blue=control phase; Green=intervention phase. An online survey was conducted during month 6 of the study. A focus group was conducted one month after the study concluded.

# Figure S2. Image of the CATH TAG



# Additional details regarding the intervention

The information below provides additional information regarding the intervention and implementation of the intervention, to that which is already supplied in the main paper. The purpose of providing this additional information to enhance the understanding of the intervention and reproducibility.

Each working day, a local staff member reviewed participants who had an indwelling urinary catheter and collected data. In addition, the staff member checked to ensure that a CATH TAG had been applied when required (intervention ward). For patients who were transferred from a control ward to an intervention ward, a CATH TAG was attached to their urinary catheter upon transfer to the intervention ward. For patients who were transferred from an intervention ward to a control ward, the CATH TAG was removed.

**For each category of intervention provider describe their expertise, background and any specific training given**

* + Research officer
    - The research officer supported the study and study team. She was with the research team and visited the participating hospital to assist with implementation of the intervention. She was responsible for the development of educational and awareness material, liaising closing with the infection control team based at the hospital. The research officer has a Masters degree in Clinical Psychology.
  + Infection control nurse
    - A designated infection control nurse supported the project and implementation of the intervention. She distributed the educational and awareness material in the lead up to each cluster transferring to the intervention phase. She worked closely with the research office and attend the wards on a daily basis. Her expertise is the area of infection prevention and control.

**When and how much**

* + Educational material was provided in the week leading up to transition to the intervention, in each ward (cluster) that was transitioning.
  + There was opportunistic discussions with staff at this time, lasting a few minutes
  + Each day at visit to the ward occurred, opportunistic discussions also occurred.

**Tailoring**

* + Once the educational material was developed (in consultation), there was no further tailoring of material

**How well and fidelity**

* + Daily visits to the wards occurred. At this time, for participants who had a catheter, there was an observation made with regards to whether the CATH TAG was applied (when it should be) or removed (in cases where a patient was transferred from an intervention to control ward).
  + The observation was performed for each participant, each time they were either initially included in the study AND when they transferred to a ward in a different phase of the study.
  + A correction if required was made at this time
    - For participants who did not have a CATH TAG applied, but were in an intervention ward, it was applied.
    - For participants who did have a CATH TAG applied, but were in an control ward, it was removed.
  + For participants in the control phase (n=782 observations), 1.7% required the CATH TAG to be removed, i.e. 98.3% correctly did not have a CATH TAG applied.
  + For participants in the intervention phase (n=839 observations), 21.8% required a CATH TAG to be applied by the infection control nurse, as it was not present.

# Online survey questions

The questions used in the online survey are detailed below.

**Consent**

1. Agree to participate/consent question

**Demographic and introductory**

1. What is your gender? (Male, Female, Other, Prefer not to say)
2. What is your age?
3. In what position are you currently employed?
4. What is your primary ward?
5. How many years of nursing experience post registration do you have?
6. What is your highest level of (completed) qualification?
7. Overall, how satisfied or dissatisfied are you \* with the CATH TAG? (Sliding scale 0-100)
8. How likely is it that you would recommend the CATH TAG to be used in all Australian hospitals? (Sliding scale 0-100)

**Likert scale questions**

Please rate the following statements, ranging from strongly AGREEto strongly DISAGREE (5 point scale).

1. It was easy for me to \* use the CATH TAG
2. I received sufficient training to use the CATH TAG
3. I integrated the CATH TAG in my daily routine
4. The CATH TAG was helpful in my daily routine
5. The CATH TAG was helpful in reminding me to check the need for ongoing catheterisation
6. I trust the CATH TAG to remind me in time to check on catheters
7. I think the CATH TAG decreased my workload
8. I would like to use the CATH TAG in future

**Likert scale questions**

Please rate the following statements, ranging from OFTENto NEVER (5 point scale).

1. Patients asked me about the CATH TAG
2. Patients notified me about the CATH TAG changing from green to red or from red to green

**Other questions**

1. My general experience with \* the CATH TAG was… (Sliding scale 0-100, very negative to very positive)
2. I believe my patients’ general experience with the CATH TAG was… (Sliding scale 0-100, very negative to very positive)
3. Please record any other comments here about your experience of using the CATH TAG.
4. Do you think the CATH TAG can potentially improve nursing practice and procedure? (Yes/No)
5. Did you experience any problems with the CATH TAG?
6. If so, please specify
7. Did you have to remove the CATH TAG from the catheter before it was due to be removed? (For example, because 'it was in the way', or any other kind of problem.)
8. If so, why?

# Survey development

The survey was developed by the research team. During the development phase, pilot testing was conducted with registered nurses, to improve the clarity of questions and identify any potential issues. Two infection control professional external to the research team also reviewed by the survey independently and provided feedback.

## Questions associated with primary and secondary study outcomes

Survey questions related to the second objective of the study (To determine whether the CATH TAG has an effect on nurses’ ability to deliver patient care) were developed and allocated to each outcome a priori.

### Primary outcome

* ‘Ease of Use
  + Question 10 “It was easy for me to use the CATH TAG”
  + Question 11 “I received sufficient training to use the CATH TAG”
  + Question 12 “I integrated the CATH TAG in my daily routine”

### Secondary outcomes

* ‘Effectiveness’
  + Question 13 “The CATH TAG was helpful in my daily routine”
  + Question 14 “The CATH TAG was helpful in reminding me to check the need for ongoing catheterisation”
  + Question 15 “I trust the CATH TAG to remind me in time to check on catheters”
  + Question 16 “I think the CATH TAG decreased my workload”
  + Question 17 “I would like to use the CATH TAG in future”.
* ‘Changes in ownership’
  + Question 18 “Patients asked me \* about the CATH TAG.”
  + Question 19 “Patients notified me about the CATH TAG changing from green to red or from red to green.”
* ‘Barriers and problems’
  + Question 24 “Did you experience any problems \* with the CATH TAG?

# Reason for patient censoring.

## Table S2. Reason for patient censoring

|  |  |  |
| --- | --- | --- |
| **Reasons for censoring** | **n** | **Percentage** |
| Catheter removed | 974 | 83.5% |
| Deceased | 37 | 3.2% |
| Transferred to non-participating ward with catheter | 156 | 13.3% |

# Online survey results

## Table S3. Demographics of nurse-participants

|  |  |
| --- | --- |
|  | *n*(%) |
| Sex |  |
| Male | 4(4.9) |
| Female | 77(93.9) |
| ICU or not ICU |  |
| ICU | 19(23.2) |
| All other wards | 63(76.8) |
| Highest Qualification |  |
| Diploma (Other) | 9(11) |
| Bachelor Degree (Other) | 61(74.4) |
| Master’s Degree | 7(8.5) |
| Medical Degree | 1(1.2) |
| Other | 4(4.9) |
| Registered nurse |  |
| Yes | 68(82.9) |
| Years of Experience post registration |  |
| Mean (*SD*) | 10.05(9.04) |
| Range | 0 - 38 |
| Age in years |  |
| Mean (*SD*) | 36.12(11.26) |
| Range | 19 - 75 |

## Table S4. Likert scale response to survey questions

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Question** | **Response** | **ICU** | | **Non ICU** | | **All included wards/units** | |
|  |  | n | Total N % | n | Total N % | n | Total N % |
| It was easy for me to use the CATH TAG. | Disagree | 0 | 0.0% | 1 | 1.6% | 1 | 1.2% |
| Agree | 17 | 89.5% | 55 | 87.3% | 72 | 87.8% |
| Neither agree nor disagree | 2 | 10.5% | 7 | 11.1% | 9 | 11.0% |
| Total | 19 |  | 63 |  | 82 |  |
| I received sufficient training to use the CATH TAG. | Disagree | 5 | 26.3% | 13 | 20.6% | 18 | 22.0% |
| Agree | 14 | 73.7% | 36 | 57.1% | 50 | 61.0% |
| Neither agree nor disagree | 0 | 0.0% | 14 | 22.2% | 14 | 17.1% |
| Total | 19 |  | 63 |  | 82 |  |
| I integrated the CATH TAG in my daily routine. | Disagree | 7 | 36.8% | 10 | 15.9% | 17 | 20.7% |
| Agree | 6 | 31.6% | 45 | 71.4% | 51 | 62.2% |
| Neither agree nor disagree | 6 | 31.6% | 8 | 12.7% | 14 | 17.1% |
| Total | 19 |  | 63 |  | 82 |  |
| The CATH TAG was helpful in my daily routine. | Disagree | 12 | 63.2% | 14 | 22.2% | 26 | 31.7% |
| Agree | 5 | 26.3% | 38 | 60.3% | 43 | 52.4% |
| Neither agree nor disagree | 2 | 10.5% | 11 | 17.5% | 13 | 15.9% |
| Total | 19 |  | 63 |  | 82 |  |
| The CATH TAG was helpful in reminding me to check the need for ongoing catheterisation. | Disagree | 11 | 57.9% | 10 | 15.9% | 21 | 25.6% |
| Agree | 4 | 21.1% | 45 | 71.4% | 49 | 59.8% |
| Neither agree nor disagree | 4 | 21.1% | 8 | 12.7% | 12 | 14.6% |
| Total | 19 |  | 63 |  | 82 |  |
| I trust the CATH TAG to remind me in time to check on catheters. | Disagree | 9 | 47.4% | 10 | 15.9% | 19 | 23.2% |
| Agree | 5 | 26.3% | 42 | 66.7% | 47 | 57.3% |
| Neither agree nor disagree | 5 | 26.3% | 11 | 17.5% | 16 | 19.5% |
| Total | 19 |  | 63 |  | 82 |  |
| I think the CATH TAG decreased my workload. | Disagree | 11 | 57.9% | 19 | 30.2% | 30 | 36.6% |
| Agree | 3 | 15.8% | 18 | 28.6% | 21 | 25.6% |
| Neither agree nor disagree | 5 | 26.3% | 26 | 41.3% | 31 | 37.8% |
| Total | 19 |  | 63 |  | 82 |  |
| I would like to use the CATH TAG in future. | Disagree | 9 | 47.4% | 8 | 12.7% | 17 | 20.7% |
| Agree | 6 | 31.6% | 35 | 55.6% | 41 | 50.0% |
| Neither agree nor disagree | 4 | 21.1% | 20 | 31.7% | 24 | 29.3% |
| Total | 19 |  | 63 |  | 82 |  |
| Patients asked me about the CATH TAG. | Never | 17 | 89.5% | 25 | 39.7% | 42 | 51.2% |
|  | Seldom | 2 | 10.5% | 11 | 17.5% | 13 | 15.9% |
|  | Sometimes | 0 | 0.0% | 15 | 23.8% | 15 | 18.3% |
|  | Often | 0 | 0.0% | 8 | 12.7% | 8 | 9.8% |
|  | Very often | 0 | 0.0% | 4 | 6.3% | 4 | 4.9% |
| Patients notified me about the CATH TAG changing from green to red or from red to green | Never | 18 | 94.7% | 35 | 55.6% | 53 | 64.6% |
|  | Seldom | 1 | 5.3% | 7 | 11.1% | 8 | 9.8% |
|  | Sometimes | 0 | 0.0% | 11 | 17.5% | 11 | 13.4% |
|  | Often | 0 | 0.0% | 6 | 9.5% | 6 | 7.3% |
|  | Very often | 0 | 0.0% | 4 | 6.3% | 4 | 4.9% |

# Focus group – Detailed results

## Summary of analysis and coding methods

At the beginning of the focus group interview, we asked participants to write a brief statement to position their opinion regarding the CATH TAG before commencing discussion. The statements reflected a largely positive attitude towards the CATH TAG, with some comments related to the potential benefits of the CATH TAG for nursing practice and procedures associated with patient care. These written comments were included in the analysis of the data from the focus group interview. Once we became very familiar with the data (through process of immersion and memoing), we then proceeded to code each piece of meaningful data collected during the focus group interview.

During the coding process, we used a combination of pre-determined and emergent codes. Some of the pre-determined codes were drawn from the way we broke down the research question into the following categories about the nurses’ perceptions of:

* ease of use;
* barriers;
* applicability to specific contexts;
* impact on patient care;
* impact on interactions with patients;
* impact on patient ownership; and
* patient perceptions.

We also added two other pre-determined codes to our coding structure that reflected the questions we added to the focus group interview schedule, as requested by the CATH TAG developer. These questions sought participants’ views about

* reactions to new prototype; and
* suggestions for future uses development of CATH TAGs.

Just before coding began, three of the researchers, spent some time memoing the data according to the procedures outlined in the memoing section of this data analysis manual. After memoing the raw transcript of the focus group we noted a number of issues that were evident in the participants’ comments. After our memoing session, we added a additional codes to our list of pre-determined codes and more codes were added during the coding process to reflect the emergent themes in the data. Together, the codes used (including the pre-determined and emergent codes) ensured we used a combination of deductive and inductive methods of analysis to identify the key themes in the data.

We treated each piece of meaningful data by attaching a label/ code to it. Eventually, the collection of pre-determined codes, outlined above, grew to also include emergent codes. Once all of the data were coded, some similar codes were collapsed, some were renamed to clarify their meaning and a few were relocated to establish their relationship to other codes. Groups of codes were classified to form themes. Finally, a coding structured emerged that represented the following themes and sub-themes, which also acknowledged that some groups of themes were related.

## 

## Summary of results

Five nurses took part in the focus group interview which took place on Thursday 31 May 2018. The participants in the focus group ranged from 28 through to 74 years of age and worked in varied wards including subacute, surgical, infection control and oncology. All participants were female. The results from the analysis and coding processes have identified the following themes and sub-themes in the focus group data:

1. **Issues related to practical use of the CATH TAG during the project**  **(174 comments):**
   * ease of use (18 comments);
   * usefulness (6 comments)
   * barriers of use, problems with the CATH TAG (59 comments);
   * applicability to varied patients, procedures and wards (51 comments);
   * hospital related factors (40 comments);
2. **Issues related to patient care and patient perceptions** **(76 comments):**
   * patient care (37 comments); and
   * patients’ perceptions (39 comments).
3. **Issues related to future use of the CATH TAG (85 comments):**
   * suggestions for CATH TAG device options (50 comments); and
   * suggestions for new procedures to use with the CATH TAG (35 comments).

Tables, S5, S6 and S7 provide an explanation of each of the themes and sub-themes above in greater detail, with associated quotation examples. Throughout many of the themes listed above that reflected groups of comments, a couple of ideas were woven throughout:

1. Need for training, education, instruction about use of the CATH TAG in relation to catheters, hospital policies, knowledge of nurses and doctors.

2. Attitude about the CATH TAG was commented upon in relation to nurses (especially comparisons across wards), patients, doctors.

Interestingly, the two issues above are largely related to education about health care and patients.

## Table S5. Thematic map of themes and subthemes in quantitative data: Issues related to practical use of the CATH TAG during the project

|  |  |  |
| --- | --- | --- |
| **Theme** | **Sub-themes** | **Example comments** |
| Ease of use | Accessibility | “... easy to get to …” |
| Lights | “... it was a reminder to people to check” |
| Simplicity of use | “To me it’s easy just to see” |
| Usefulness | [no sub-themes] | “I’ve put I believe they are a good idea, that if implemented they will - underlined - should decrease UTIs”  “So we, as nurses, do so much damage to our patients, by not following protocol”  “[...] without the CATH TAG [...] you’ve got to go back months sometimes to find when did this catheter get put in.”  “[...] I think that they’re a very very good idea of having CATH TAG.” |
| Barriers and problems associated with use of the CATH TAG | Burden, extra work or time required to use, not accessible | “They [nurses] are too busy, they were just too busy”  “They were in the wrong place in a lot of wards” |
| Cost | “Let’s hope it gets to be less than $4” |
| Flaws of product | “It was faded, wet and not flashing”  “Sometimes soggy and falling off” |
|
| Lack of cooperation of nurses, negative attitude | “ICU was incredibly negative”  “We were too busy, you don’t have time, because that’s [CATH TAG] not important enough”  “I think that one of your barriers is negativity”  “It’s a resistance to change” |
|
| Training needed | “A lot of nurses didn’t know” |
|
| Applicability to varied contexts | Varied types of patients | “Why would you put a CATH TAG on those patients?”  “You have your oncology patients who are going to be there for a long time, they need it.” |
| Varied wards | “Choose the ward that you’re going to do it”  “[...] In the wards where you’ve got a quick turn-over [...] you don’t need them”  “It needs to go into ED and operating theatre initially” |
| Varied hospital procedures | “I work in the surgical ward, so mostly our catheters ... they don’t last long”  “Choose your procedure before you start whacking a CATH TAG on it” |
| Patient perceptions | Noticed the CATH TAG or asked questions | “I had one patient in rehab when we do our rounds and she’d go ‘what is this’”  “[...] she [patient] did ask a lot in the beginning and we said pretty much the same as you, and yeah, she’d just get involved like that [...]” |
|
| Didn’t notice the CATH TAG | “So I don’t think maybe half of the patients are knowing they’ve got the tag on.” |
| Concerned about it getting wet | “Knowing some patients would get annoyed when it would get wet” |
| Lights may create concern | “I think there’s a lot of photophobia [...]” |
| Patients hid catheters (privacy) | “You know we had to be so subtle when we went around” [...] Because a lot of people didn’t want to make it known that they had something in their privates”  “They tend to hide the catheters” |
| Patients didn’t want to make work for nurses | “... they don’t want to make any complaints and they don’t want to make waves and they’ll say … sorry, sorry, sorry, I did something” |
| Impact on interactions with patients | “Well the one lady that we had it [CATH TAG] with she’s very involved with all her care and she thought it was a great idea.”  “Nobody [patients] was negative, no.” |
| Hospital related factors | Length of time for ideal catheter use | “Some people will say four weeks, some people say six weeks, some people say eight weeks.” |
| When the CATH TAG was removed |  |
| Decisions to insert and remove catheters | “[...] but you can’t say whether long time or short time [catheter]”  “[...] they [doctors) are usually resistant to remove the catheters in time.” |
| Purpose of catheters |  |
| Nurses’ awareness of HAIs |  |

## Table S6. Thematic map of themes and subthemes in quantitative data: Issues related to patient care and patients’ perceptions

|  |  |  |
| --- | --- | --- |
| **Theme** | **Sub-themes** | **Example comments** |
| Patient perceptions | noticed the CATH TAG or asked questions | “I had one patient in rehab when we do our rounds and she’d go ‘what is this’”  “[...] she [patient] did ask a lot in the beginning and we said pretty much the same as you, and yeah, she’d just get involved like that [...]” |
|
| didn’t notice the CATH TAG | “So I don’t think maybe half of the patients are knowing they’ve got the tag on.” |
| concerned about it getting wet | “Knowing some patients would get annoyed when it would get wet” |
| Lights may create concern | “I think there’s a lot of photophobia [...]” |
| patients hid catheters (privacy) | “You know we had to be so subtle when we went around” [...] Because a lot of people didn’t want to make it known that they had something in their privates”  “They tend to hide the catheters” |
| patients didn’t want to make work for nurses | “... they don’t want to make any complaints and they don’t want to make waves and they’ll say … sorry, sorry, sorry, I did something” |
| Patient care | patient consent | “So, I went down and spoke to her [patient] and asked permission [to put the CATH TAG on]. I just thought that was the right thing to do.”  “Once it’s included in the bag, it’s not a trial, it’s just part of their treatment, of their care.” |
| nurses following instructions | “[...] we couldn’t get in to see if the CATH TAG was on -often it was on- but it was on the inside” |
| researcher expectations | “Because once they left the ward that we were doing initially, we weren’t following them up, so I can see why that would have been confusing and that could have done better” |
| Length of time for catheter or removal of CATH TAG |  |
| Awareness of HAIs |  |

## Table S7. Thematic map of themes and subthemes in quantitative data:Issues related to *future* use of the CATH TAG

|  |  |  |
| --- | --- | --- |
| **Theme** | **Sub-themes** | **Example comments** |
| CATH TAG device options | Incorporate countdown reminder system into CATH TAG | “What about a countdown [...]” |
|
| Integrated into or attached to catheter bag | “I think they need to be in a catheter set, in the packaging [...]” |
| Need date to indicate date inserted | “Yeah, we need some technique to know whether it was … which day it was actually put in” |
| Should be made of plastic | “It needs to be made of hard plastic rather than cardboard” |
| Template in e-record system | “I think that there should be a template in ieMR” |
| Armband | “What about an armband on the patient’s arm?” |
| Suggestions for new procedures to use with the CATH TAG | Tracking patients | “But they certainly would be wonderful in nursing homes as well”  “[...] That’s what we need - we need them for cannulas because we’ve got such a problem with cannulas’  “We need to choose the procedures [...]”  “Yeah, I can see the future; this is just the beginning of what this could do for other devices and systems.” |
| Ease of access on wards | “The CATH TAGs need to be put somewhere where they can all find it easy” |
| Incentives for low infection rates | “There is a fine … government fines the hospital a lot of money” |
| Evaluation of effectiveness | “How do we know we’ve saved a UTI?” |
| Not located on the wall | “Oh, that’s breaching confidentiality” |
| Complete details on CATH TAG | “ … but they still have to fill it out …” |
| Informing patients | “Maybe if it does become a thing, put it in a little brochure i the admission paperwork, so they get a chance to read through it instead of us explaining it.” |
| Involvement of doctors | “Now we’ve got lots of good doctors and they do care … if patients are getting a UTI, it’s of great concern to the doctors.” |
| When CATH TAG is not needed | “There are places that this CATH TAG is not needed” |

### Explanation of the main ideas in the above table

The nurses’ attitudes towards the use of the CATH TAG, as expressed during the focus group interview, were positive when asked about its ease of use and effectiveness. This attitude was reflected in the overall positive, constructive atmosphere during the focus group. The observational notes recorded by one of the research team also substantiated this positive atmosphere during discussions about the CATH TAG. However, they were quite articulate about some of the problems associated with the CATH TAG. Their comments about the problems were largely expressed in terms of the future of the CATH TAG so, although they acknowledged problems with the CATH TAG, they still felt that the CATH TAG was useful enough to develop for future use. This issue was also evident during the coding process; many comments about the problems stated regarding the CATH TAG were also coded as suggestions for possible improvements in the future. The nurses who took part in the focus group talked about the CATH TAG in terms of constructive feedback. Their suggestions about modifications that could take place in the future appeared to be based on an assumption that there was indeed a future for the device, based on its usefulness. As in many professions, the practitioners within the profession of nursing are trained to analyse and diagnose problems, and then to apply solutions. Thus, it seems that the nurses in this study were no different - they acknowledged the usefulness of the CATH TAG overall but had quite a few suggestions for how it could be improved. As such, the quantity of their comments about the CATH TAG’s flaws and suggestions for the future were not necessarily proportionally indicative of their overall view of the device.

### Issues related to practical issues of the CATH TAG during the project

The participants’ comments in this section of the interview were focused on five main areas:

* 1. ease of use of CATH TAG;
  2. usefulness of the CATH TAG;
  3. barriers and problems associated with the CATH TAG;
  4. applicability of the CATH TAG’s use (context of use); and
  5. hospital related issues regarding use of the CATH TAG.

The focus group participants’ comments about ease of use and usefulness of the CATH TAG ranged from issues related to accessibility of the CATH TAG within the wards, the reminder lights built into the CATH TAG, its simplicity of use and the importance of the CATH TAG in relation to improving patient care and nursing procedures. As well as the benefits of the CATH TAG in association with catheter use in various wards, the nurse participants also noted some barriers or problems associated with its use. They noticed that the use of the CATH TAG caused nurses more work and time in the busy schedule of the ward, and that there were some nurses who had a negative attitude to its use and, therefore, were not considered cooperative in relation to CATH TAG use. They noted some flaws of the product, especially in relation to it getting wet because this reduced its effectiveness and durability. A couple of nurses were also concerned about its cost. Quite a few of their comments related to the need for training of nurses in the use of the CATH TAG.

Many of the nurses’ comments were related to how applicable the CATH TAG was in various contexts, with specific comments made about its use in relation to various types of patients (long term, short term, patients suffering from various diseases), varied types of wards (more suited to wards where patients were long term or located in the ward for more than a day or so) and in conjunction with various types of hospital procedures (such as surgical processes, intended purpose of catheters, length of use of catheters).

### Issues related to patient care and patients’ perceptions

The second major group of participants’ comments in this section of the focus group interview were focused on two main areas:

1. patient care in association with the CATH TAG; and
2. patients’ perceptions of the CATH TAG.

The participants’ comments about their observations regarding how the patients perceived the CATH TAG ranged from mild interest through to asking questions about the CATH TAG or not noticing the CATH TAG at all. The nurses noticed that some patients were concerned about the CATH TAG getting wet which may cause more work for the nurses. There were a few comments regarding privacy issues in relation to catheter use in general, with one nurse noting that some patients tend to hide catheters due to embarrassment and that, in turn, this practice would also result in the CATH TAG being hidden from view which may reduce its effectiveness. A couple of the nurses thought that the light on the CATH TAG may cause patients some concern. It is noteworthy that the participants’ comments regarding patients’ perceptions of the CATH TAG were not characterised by any strong emotions (negative or positive) and that the amount of comments about patients’ perceptions of the CATH TAG were not substantial in comparison to the researchers’ expectations.

There were a few areas mentioned by the focus group participants that focused on how the use of the CATH TAG was related to their care of patients. Some participants asked about whether they should be asking patients for their consent about using the CATH TAG, while others voiced concerns about general catheter use (such as the length of time a catheter was used or when it should be removed), nurses’ awareness of HAIs and the procedures associated with using the CATH TAG.

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### Issues related to future use of the CATH TAG

The third major group of participants’ comments from the focus group included participants’ suggestions about the future of the CATH TAG, or a similar device. These comments focused on two main areas:

1) suggestions about future CATH TAG device options; and

2) suggestions for new procedures to use in association with the CATH TAG.

Suggestions about the device were focused on modifications about how the CATH TAG could be attached to or integrated into a catheter, how mechanisms could be incorporated into the device (e.g., a countdown), how the CATH TAG materials could be improved (e.g., made of plastic or turned into an armband). A few participants believed that a reminder template incorporated into the hospital’s e-record system would work better than a CATH TAG on a catheter.

The participants also made some suggestions about new hospital procedures that could be introduced in conjunction with the use of a CATH TAG, or similar device. Being able to easily access the device and record details on the device were reported as being important issues. Some participants were concerned about how patients would be tracked when they moved between wards and other participants were concerned about how patients would be informed about the use of the devices. Other procedural issues were related to involvement of doctors, introducing financial incentives for maintaining low infection rates and evaluating the effectiveness of the CATH TAG. A few participants agreed that the idea of putting a CATH TAG device on the wall behind a patient (instead of on the catheter itself) would not be approved by the hospital and may not be appreciated by patients. Lastly, a couple of participants believed it was important for medical practitioners to know when *not* to use a CATH TAG.

Suggestions about changes:

* Many of the suggested changes were focused on ease of access (location) and materials (e.g., to address the issue of wet CATH TAGs).
* The participants also suggested a number of other alternative devices such as the armband, TURP, template within electronic patient notes system,
* Some of the participants noted other suggestions such as incorporating a countdown mechanism with a device to act as a reminder system for how long the catheter had been inserted and when it should be removed.

### Other comments

There was general agreement among the participants that the CATH TAG worked better on some wards than others. Although there were quite a few comments offered about XXX [removed for publication], it was noted that many of the catheters were actually inserted while the patient was in XXX [removed for publication].

* Some negativity: “I'm think that one of your barriers is negativity.” while some participants attributed this to “And it's a resistance too to change.
* Strong theme: education and training.
* Ideal use. Many of the nurses mentioned types of patients and wards where the CATH TAG may be of more use than others, such as nursing homes and ED:

“... they certainly would be wonderful in nursing homes as well - I don't know whether you've thought of nursing homes ...”

“... it needs to go into ED and operating theatre initially, because that's where they put a lot of catheters in …”

### Points of confusion

There was some confusion on a few points regarding typical catheter use and the project.

1. Length of time a catheter should remain in a patient. The confusion about this was expressed partly among the researchers and also among the nurses.
2. When the catheter was inserted. Throughout the focus group discussion, it appeared that nurses were often unsure about when a catheter had been inserted into a patient. This confusion about the “start date” of a catheter provides a strong rationale for the importance of introducing a device such as the CATH TAG into the care of patients who need catheters. Since it appears that catheter-related infections is related to the length of time a catheter remains inserted and that some insertion lengths may be longer than ideal, then the use of a device such as the CATH TAG would assist in the management of this issue and, thus, the reduction of extra time a catheter remains in place.
3. Instructions about how to use the CATH TAG. Some nurses clearly understood how the CATH TAG was meant to be used. However, some nurses were not sure because they weren’t on duty when the CATH TAGs were introduced.

Quite a lot of discussion about how long the catheter stays in for, how it needs to stay in for particular types of patients and why it stays in for long or short times.

CONSORT 2010 checklist of information to include when reporting a randomised trial

|  |  |  |  |
| --- | --- | --- | --- |
| Section/Topic | Item No | Checklist item | Reported on page No |
| Title and abstract | | | |
|  | 1a | Identification as a randomised trial in the title | 1 |
| 1b | Structured summary of trial design, methods, results, and conclusions (for specific guidance see CONSORT for abstracts) | 2 |
| Introduction | | | |
| Background and objectives | 2a | Scientific background and explanation of rationale | 3 |
| 2b | Specific objectives or hypotheses | 3 |
| Methods | | | |
| Trial design | 3a | Description of trial design (such as parallel, factorial) including allocation ratio | 4 |
| 3b | Important changes to methods after trial commencement (such as eligibility criteria), with reasons | NA |
| Participants | 4a | Eligibility criteria for participants | 4-5 |
| 4b | Settings and locations where the data were collected | 4 |
| Interventions | 5 | The interventions for each group with sufficient details to allow replication, including how and when they were actually administered | 5 (& supplementary) |
| Outcomes | 6a | Completely defined pre-specified primary and secondary outcome measures, including how and when they were assessed | 6 |
| 6b | Any changes to trial outcomes after the trial commenced, with reasons | 5 |
| Sample size | 7a | How sample size was determined | 7 |
| 7b | When applicable, explanation of any interim analyses and stopping guidelines | N/A |
| Randomisation: |  |  |  |
| Sequence generation | 8a | Method used to generate the random allocation sequence | 4 |
| 8b | Type of randomisation; details of any restriction (such as blocking and block size) | 4 |
| Allocation concealment mechanism | 9 | Mechanism used to implement the random allocation sequence (such as sequentially numbered containers), describing any steps taken to conceal the sequence until interventions were assigned | 4 |
| Implementation | 10 | Who generated the random allocation sequence, who enrolled participants, and who assigned participants to interventions | 4 |
| Blinding | 11a | If done, who was blinded after assignment to interventions (for example, participants, care providers, those assessing outcomes) and how | NA |
| 11b | If relevant, description of the similarity of interventions | NA |
| Statistical methods | 12a | Statistical methods used to compare groups for primary and secondary outcomes | 6-7 |
| 12b | Methods for additional analyses, such as subgroup analyses and adjusted analyses | 6-7 |
| Results | | | |
| Participant flow (a diagram is strongly recommended) | 13a | For each group, the numbers of participants who were randomly assigned, received intended treatment, and were analysed for the primary outcome | 7-8 |
| 13b | For each group, losses and exclusions after randomisation, together with reasons | NA |
| Recruitment | 14a | Dates defining the periods of recruitment and follow-up | 7 |
| 14b | Why the trial ended or was stopped | NA |
| Baseline data | 15 | A table showing baseline demographic and clinical characteristics for each group | Table 1 7-8 |
| Numbers analysed | 16 | For each group, number of participants (denominator) included in each analysis and whether the analysis was by original assigned groups | Table 1 & 7-8 |
| Outcomes and estimation | 17a | For each primary and secondary outcome, results for each group, and the estimated effect size and its precision (such as 95% confidence interval) | 7-8 |
| 17b | For binary outcomes, presentation of both absolute and relative effect sizes is recommended | N/A |
| Ancillary analyses | 18 | Results of any other analyses performed, including subgroup analyses and adjusted analyses, distinguishing pre-specified from exploratory | 8 |
| Harms | 19 | All important harms or unintended effects in each group (for specific guidance see CONSORT for harms) | N/A |
| Discussion | | | |
| Limitations | 20 | Trial limitations, addressing sources of potential bias, imprecision, and, if relevant, multiplicity of analyses | 11 |
| Generalisability | 21 | Generalisability (external validity, applicability) of the trial findings | 10-11 |
| Interpretation | 22 | Interpretation consistent with results, balancing benefits and harms, and considering other relevant evidence | 9-11 |
| Other information | | | 2 |
| Registration | 23 | Registration number and name of trial registry |  |
| Protocol | 24 | Where the full trial protocol can be accessed, if available | 3 |
| Funding | 25 | Sources of funding and other support (such as supply of drugs), role of funders | 11 |