A surgical golden patient, surgical theatres team

TEAM MEMBERS:

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Background:

In 2013, a report commissioned by the world health organisation stated that air pollution causes cancer. It is widely reported that the NHS is responsible for 5.4% of all the UK's greenhouse gases. With this in mind, it is essential for us at The Christie and other health care providers to find more sustainable processes so we can prevent cancer and other health conditions whilst treating them.

As the NHS heads towards providing a net zero health service, it is hard to imagine when working in an operating theatre; Surrounded by a never-ending supply of single use items double wrapped to protect their sterility. Anaesthetic drugs and gases required to keep our patients anaesthetised and comfortable. The large number of healthcare professionals required to safely take care of patients during this critical time each travelling to work. The number of bags of waste and packaging at the end of every case requiring incineration at high temperatures to prevent any cross contamination. All this can be justified when a patient receives a treatment which may potentially save or prolong their life but when that case is cancelled due to non-clinical reasons such as bed issues, we have found that a number of these items are wasted and end up in the bin without having been used.

Bed issues are faced by hospitals across the UK and The Christie has one of the best utilisation rates in the northwest it still faces difficulties. Surgical list delays and cancellations have financial, social and environmental impact. During the green team competition, we have looked to quantify the environmental and financial impact of delays and cancellations of surgical patients due to unavailability of post-surgical beds in the hospital, linking this to the social impact they have on our patients and colleagues.

'Golden patient' schemes have been adopted by many trusts. Blackpool used their golden patient scheme to identify patients for next day discharge so that elements of the patients discharge such as take-home medication and transport can be arranged in advance. This resulted in earlier discharges, freeing up bedspaces earlier. The Royal Gwent hospital's transformation team aimed to

improve the start time of the list with the introduction of the 'golden patient' initiative. A protocol was agreed between the orthopaedic, anaesthetic and theatre staff where a 'golden patient' was selected for preoperative anaesthetic assessment by 14:00 the day before surgery and sent for at 08:15 as the first case on the trauma list. This initiative resulted in earlier starts to the operating list and increase theatre utilisation.

Specific Aims:

Short term aim: To identify the potential environmental, financial and social impacts in reducing on the day cancellations and delays to commencing surgical procedures due to unconfirmed bedspaces

Long term aim: To reduce on the day cancellations and delays to commencing surgical procedures due to unconfirmed bedspaces by introducing a 'golden patient' to each operating list. The golden patient would have their bed space confirmed the day before surgery. To use the golden patient confirmation as an opportunity to highlight bed issues for the following day allowing us to start the escalation process the day before surgery rather than the morning of.

Methods:

Short term aim

Our clinical practise and day to day working experience had left us feeling as though delays and cancellations due to bed issues had become an issue within our department. Feeling frustrated by this regular occurrence we looked to see if sustainability and the green team competition could be an opportunity to address this problem.

We completed a process map (appendix 2) which identified 'hotspots' of waste during delayed or cancelled procedures. This included

- equipment and medications that would be opened and discarded without use
- energy waste from theatres being turned on before use,
- inefficient use of Bank staff time and unnecessary travel
- the social and financial impact that cancellations have on our patients
- staffing issues created as a result of lists overrunning due to delayed starts
- lists that over run due to not starting on time

This process enabled us to understand that we needed to target a reduction in delays and cancellations in the first place, rather than focus on consumables or energy waste individually. A 'golden patient' initiative would target all the above aspects of waste.

To uncover if our colleagues also felt this was an issue within the department, we undertook a survey of the surgical theatre team. We involved a lead nurse for the post-operative wards to discuss our findings and the proposed solution to see if our idea, which effective on paper would be possible in action.

Long term aim - Planned actions

The defining element of golden patient initiatives is that action is taken a day prior to an event to avoid delays and improve efficiency. We propose that by allocating our priority patients a bed the day before surgery we can address issues of delays we currently face and the knock-on effect of overruns they cause. Early bed intervention may enable us to highlight and correct bed issues in advance to avoid cancellations on the day or where cancellations cannot be avoided look to inform the patient the night before to avoid them travelling to the hospital, fasting and facing the surgical check in process when they arrive at the hospital. Initially we would aim to introduce one golden patient for theatres, however long term this could increase to one patient per theatre, in the hope that over time all our morning patients would have their bed spaces allocated the day before surgery.

To effectively introduce the Golden patient initiative, we would require support from various departments including our post-surgical wards, the service management team, bed managers and clinicians who create priority lists for our patients. We would need a service / bed manager to oversee this change and look to audit our base line data at 1 month, 3 months and 12 months to monitor if the change had been effective in reducing these cancellations and delays.

At the time of submitting this report we have not attempted to implement this change. Instead, we plan to use this report to highlight the issue we are facing, the impact it is having and use the green team competition as a platform to address this problem to those who are able to bring about this change.

Measurement:

Patient outcomes:

Using the theatre metric system, we were able to pull 12 months of data outlining:

- On the day cancellations due to unavailability of beds
- Delayed theatre start times due to waiting for confirmation of beds
- Theatre list over runs as a result of delayed start times due to waiting for confirmation of patient beds

We collated this data and compared it to the average number of additional bank/agency staff we use on a daily basis and staff who stayed at the end of their shift to cover the over runs in theatre.

Environmental sustainability:

Consumables and medications:

We developed a list of consumables and drugs most likely to be opened and discarded un-used following a cancellation. To estimate the carbon footprint of the consumables and drugs wasted from a cancellation, an Environmentally Extended Input Output Analysis (EEIOA) was used. In EEIOA, financial spend in a sector is directly converted into kgCO2e. The cost of each item was collected and converted into kgCO2e using emissions factors taken from the 2020/21 Greener NHS database.

For medical equipment the factor for medical equipment and instruments (0.465 kgCO2e/£) was used and for drugs the pharmaceutical factor (0.1277 kgCO2e/£) was used.

Waste disposal

Each drug and consumable as well as the packaging was weighed, separated by the type of disposal required (domestic, pharmaceutical and sharps). To estimate carbon emissions from waste disposal, emissions factors for domestic and clinical waste were used to convert weight (in tonnes) into kgCO2e. Waste emissions factors were taken from Rizan et al (2021), 'the carbon footprint of waste streams in a UK hospital'.

Travel

We calculated the average number of additional staff arranged per theatre each day and applied this to the number of cancellations to work out the additional travel impact of additional staff per cancellation. Distance for average miles travelled to work (commuting) were taken from the HOTT tool and converted into carbon emissions using CSH's carbon travel calculator based on national travel survey data and the BEIS database. It was assumed 0.8 bank staff travelled in per cancellation.

Energy

We obtained energy usage for theatres for 3 months of data. Due to having no base line data to compare a theatre in use/not in use we were unable to quantify energy wasted in a delayed theatre, additional energy required for theatre over running as a result of a delay and energy use potentially saved when a case is cancelled. Data was multiplied to give an annual estimate and divided in 12 operational hours per day, for 5 theatres, 5 days per week.

Using the quarterly energy consumption for surgical theatres we were able to access we were able to multiply to reach a yearly figure and divide that number into number representative of 12 operational hours for 5 days each week. This figure is heavily estimated but provided us we a rough guide to use in our calculations.

Electricity and gas carbon emissions factors have been taken from BEIS 2022 database and include Well-To-Tank (WTT) and Transmission and Distribution (T&D) emissions Gas is estimated at 4.828 kWh per operational hour (multiplied by 0.21364 CO2 emissions factor) which shows 1.0312608 kgCO2e per kwh. Electricity is estimated at 3.757 kWh per operational hour (multiplied by 0.26155 CO2 emissions factor) which shows 0.98264335 kgCO2e per kwh.

***Social sustainability*:**

We surveyed theatres employees (Appendix 1) to better understand the impact cancellations and delays have on them (both positive and negative). We also asked for input on potential changes we could make to improve our service and see their understanding of the environmental impact of our current process.

It was not possible for us to measure the social impacts on patients during the competition. However, we anticipate several potential benefits to implementation of a golden patient initiative. Moving forward with this project we would look to use patient surveys given to patients experiencing delays and cancellations to better understand the impact they have. Using this

information and the potentially reduced number of on the day cancellations/ theatre delays we are able to collate from the theatre metrics system we could evaluate if the change has been successful in improving our social sustainability.

Economic sustainability:

No implementation costs have been applied to this theoretical change.

Consumables and medications: Costings of items routinely disposed of in cancelled procedures were obtained from our procurement lead and pharmacy stores.

The cost in disposing of wasted items was calculated from prices given by our waste management lead.

Energy: We approached our trusts sustainability lead to provide us with energy consumption records and costings.

Results:

Patient outcomes:

- On the day cancellations due to unavailability of beds: 31 cases
- Delayed theatre start times due to waiting for confirmation of beds: 135 cases, 4351 minutes (72 hours) equivalent to 8 full day operating lists.
- Theatre list over run as a result of delayed start times due to waiting for confirmation of patient beds: 2426 minutes (40 hours). We would look to monitor for reduction in delays and on the day cancellations by using the data we collect through the theatre metrics system.
- Patients exposed to less cancellations and delays (causing emotional distress, unnecessary fasting, taken time off work to isolate pre surgery having a impact of their finances and work commitments)
- Treatment timelier and more efficient

Environmental sustainability:

Cancelled cases

- Consumables* set up per case – 35.3 kgCO2e
- Waste generated from cancelled case – 2.181 kgCO2e per case
- Additional staff unnecessary return travel – 9.94 kgCO2e
- Impact of average patient journey – 13.67 kgCO2e

*This is based on minimum number of consumables wasted. However, in practice more devices are frequently disposed of depending on the case cancelled, so this is likely an underestimation of CO2e per cancellation.

Total – 55.151 kgCO2e per cancelled case. With an average of 31 cancelled cases per year, this equates to 1709.681 kgCO2e. We anticipate a 50% reduction in on the day cancellations over a 12 month period would be realistic and therefore could have potential savings of 854.8405 kgCo2e.

Overruns as a result of delays due to no bed confirmation

The 40 hours theatres overrun awaiting confirmation of beds equates to 80.56 kg CO2e. We have assumed that starting with one golden patient would be realistic and reduce this overrun time by 20%, providing a saving of 16.11 kgCO2e over 12 months. Our long term aim is a 100% reduction (one golden patient per theatre) for the full saving of 80.56 kgCO2e

Total savings:

A 50% reduction in cancellations and 20% reduction in overrun could lead to savings of **870.9 kg CO2e**. This is equivalent to 2,508.3 miles driven in an average car.

Economic sustainability:

Cancelled cases

- Cost of items wasted in a cancelled case – £91.2, based on 31 cancellations per year. A 50% reduction would create a saving of £1,413.60 over 12months.
- Waste disposal costs per cancelled case - £18.26/ £566 for the 31 cases cancelled over the 12-month period analysed. A 50% reduction would create a saving of £283 per year
- Cost of additional staffing booked for an average case 1 per theatre per day. Costing £35 per hour for registered team members/ £16 per hour for non-registered. This £297.50/£136 per 8.5hour. For the 31 cancelled cases due to bed issues £9,222.50/£4,216 spent on additional staffing (dependent on whether a registered or non-registered member of staff was additionally booked) for cancelled cases over the 12-month period.

50% reduction in on the day cancellations due to no beds could save £6307.85 in wasted medical equipment, wasted pharmaceuticals & additional staffing.

Overruns as a result of delays due to no bed confirmation

- Overall time from over runs because of delayed start due to no bed confirmation – 2426 minutes (40hours) Over runs can be staffed by late team which covers 1 theatre per day. If more than 1 theatre overruns staff are asked to stay late on a bank pay rate or time owing. Per registered team member for an additional 40hours is £1400. Per non-registered team member for an additional 40 hours is £640 – Theatres use a minimum of 2x registered and 1x non-registered team members at any time. 40 hours of one full team on bank pay is £3,440
- Energy useage (roughly calculated from 3 month data available. Data multiplied to give an annual estimate and divided in 12 operational hours per day, for 5 theatres, 5 days per week) is £123.20 for 40 hours

A 20% reduction in overrun time from 1 golden patient would lead to savings of £712.64 (*£688 in additional staffing costs and £24.64 in additional energy usage).* However our long term aim is to reduce this by 100% for a total saving of £3563.20 per year.

Total savings:

A 50% reduction in cancellations and 20% reduction in overrun could lead to savings of **£7,020.49.**

Social sustainability:

The results of our survey found:

- Staff who feel delays are a problem – 100%
- Staff who feel cancellations are a problem – 62%
- Staff who feel our current bed confirmation process needs improvement – 81%
- Staff who feel day before confirmation would improve our service & prevent delays – 71%
- Staff who can see a link between cancelled cases and our carbon footprint – 43%

A more efficient service allowing us to utilise more of our operating time. Less cases requiring rebooking due to cancellations or delays would allow that time to be utilised to provide more surgery.

It was not possible for us to measure the social impacts on patients during the competition. However, we anticipate several potential benefits to implementation of a golden patient initiative. For example,

- Treatment is timelier and more efficient: When surgery start times are delayed patients and their relatives wait for longer periods of time which may increase stress and worry.
- Mentally patients face many worries and concerns whilst waiting for their surgery. Scared of both the risks their surgery involves and the risks they face if their procedure does not happen soon enough and their cancer advances.
- Less wasted patient & family journeys, which may also come with a cost saving.
- Patients with cancelled procedures may fast for no reason, and with delays will experience longer fasting periods.
- Patients go through a lengthy process before receiving their surgery which includes arranging time off work, balancing personal commitments, having to attend pre-op appointments, having bloods taken, taking pre-op medication, isolating pre surgery, travelling long distances.

Discussion:

To confirm if our planned proposal was an issue our colleagues were also experiencing, we surveyed our team. The staff survey provided insight that a high percentage of the team feel delays and cancellation are a problem. 100% of staff surveyed stated they felt delays are a problem within the department. The data we were able to collate from the theatre metric system confirmed that we

had encountered 72hours of delays over the 12month period analysed which is the equivalent of 8 full operating lists.

The calculated amount of 55.151 kgCO2e per cancelled case is significant. As no treatment was provided, the patient will still require surgery, which will be rebooked at a later date. This increases the overall carbon footprint for this patient. Over the 12-month period studied the cases cancelled on the day due to no post-surgical bed equated to minimum of 1709.68 kgCO2e entering the environment before surgical intervention has taken place.

Evaluating the financial impact of this we calculated that the wasted items set up prior to cancellation came to £91.20 per case. The elements included in the calculation of this were kept to a minimum as to not exaggerate our findings and some elements that are not essential for every case we excluded for example items such as invasive monitoring are set up in advance for most patients who will require critical care post operatively however were not included as they are not used in all instances. Practitioners are occasionally able to transfer this equipment on to another theatre however this is not always possible. Preoperatively patients encounter many processes, for example, they have bloods taken which are sent to the pathology laboratory to be processed, grouped and cross matched. These bloods are then ordered to the department for the start of the case, all of which have financial, environmental, and patient impact that was not included in this report in an attempt to keep focus on surgery specific intervention however these would increase the overall carbon footprint and cost.

Both delays and cancellation have an impact on theatre staff utilisation. Theatres encounter the cost of additional staffing, which from inspection of records, was found to average at 1 member of staff per theatre per day. Additional staff booked through the bank or agency are paid at a rate of £35 per hour for qualified members of staff or £16 for unqualified with additional agency fees. These members of staff may be reallocated to another theatre if required or sent home early if not required. Team members who stay at the end of lists to cover theatre over runs as a result of delayed starts due to no bed confirmation are also often paid a bank rate to do so. The average journey of a member of staff at the christie is calculated to create 9.94 kgCO2e. Our patients and their family members/carers also encounter financial setbacks when surgery does not go ahead as planned. Patients before surgery are asked to isolate, themselves and their partners taking time off work. They arrange travel and childcare which may not be required if given notice the day before.

The proposed process (Appendix 3) introduces a new bed communication meeting at 15.30 the day before surgery. This meeting would take place following the current 15:00 scheduling meeting which finalises surgical lists for the following day. The proposed process enables us at this time to allocate golden patient beds with the aim of reducing delays on the day of surgery. This communication also provides an opportunity to highlight problems and initiate an escalation process early. The early line of communication the golden patient initiative creates enables the wards to pre-emptively make the theatre department aware of any issues for the following day. Should issues be anticipated for the following day this early communication would enable the theatre team to start the bed escalation process the day before surgery rather than the morning of. Theatres may then plan accordingly for example involving service managers in finding solutions such as rearranging list orders to have non-bed dependent cases first to avoid delays, creating priority lists so we know which theatres can start without delay and in worst case scenarios cancelling

patients the night before surgery to avoid unnecessary fasting, travel and preoperative hospital interventions. This earlier cancellation prevents theatres from being set up and the associated waste and in the rare circumstance where cancellation is necessary it would allow staff to be reallocated or for additional bank staff to be cancelled. These steps are outlined in the proposed process.

On discussion with a lead nurse for CCU and the post-surgical ward, it was suggested that in addition to the golden patient a traffic light system could be applied to the hospitals bed management. Green light indicating there are no bed issues on the wards and surgical patients are unlikely to encounter delays or cancellations. An amber warning would indicate the potential for bed related issues and red indicate definite service issues allowing theatres to delay opening of equipment the next morning until receiving confirmation of the cases going ahead or look to rearrange operating lists to ensure day case patients are started first to avoid morning delays. We found that if even 50% of the cases cancelled due to no beds had been informed the night before we could have saved 854.84 kgCO2e, £6307.85 in wasted medical equipment and additional staffing.

The golden patient initiative may allow us to avoid this waste and additional staffing requirement as it opens lines of communication regarding the next day's post operative beds rather than waiting until the morning of the surgery. The theatre receiving the golden patient whose bed would be allocated and confirmed the night before would be able to set up in the morning without risk of wasting any medical equipment.

Limitations:

The main limitation of this study is that within the time frame available we were unable to put our plan in to practice. Due to the scope of this change and that it involves process changes across bed management, wards and theatres it would be essential to ensure the plan is robust before implementing to ensure its success. Due to not implementing this plan the conclusions drawn from the results of our findings may not be able to be applied to every scenario every day. Scenarios may occur such as overnight emergency admissions, ward closures due to infection prevention or staff shortages due to sickness that prevent the golden patient from proceeding as planned. The golden patient initiative cannot prevent this and good communication would be required to disseminate from the wards to theatres if a change has been made to the planned golden patient. Further exploration of the impact of delays and cancellations on our patients would be required to provide insight into how this initiative would improve care for them.

The proposed process of golden patient initiative in addition to an early escalation process may not be able to pre-empt or resolve all bed related problems. Following this report we also recommend further analysis of our theatre scheduling and bed requirements.

Conclusions:

In conclusion, the golden patient can be beneficial in reducing the number of delays and cancellations encountered by surgical patients due to lack of post operative bed by opening lines of communication between the bed managers, wards and theatres earlier than the current process allows. Our surgical golden patient or patients would have confirmation of their post-surgical bed

the night before their surgery allowing those patients to be brought to theatre without the delay of waiting for their bed confirmation on the day. Using this new process, we can add additional tools such as a traffic light system that warns theatres in advance of upcoming bed shortages allowing them to avoid delays by changing list orders. Where list order changes are not possible, theatres may be able to wait for confirmation before opening items that could be wasted. In extreme circumstances where it is apparent the bed issues will not be resolved, as happened 31 times over the 12-month period studied, these unfortunate patients may be able to be told in advance, avoiding unnecessary patient journeys, fasting, pre-op medication taking or blood taking.

This study was limited due to the large scope of data required and the individuality of each case and the waste it would generate. The results of the staff survey show our current process, delays and cancellation are leaving team members frustrated with 100% of those surveyed stating they feel delays are a problem within surgical theatres and 81% who feel our current bed confirmation process requires improvement. 'The golden patient' initiative will not increase the number of beds available in the hospital however apart from the time to plan and implement this process change it would not require any additional funding. We recommend further analysis of the hospitals bed requirements and highlight that other interventions or process changes may be able to address bed issues across the whole hospital.

Despite that only 43% of our colleagues surveyed could see a direct link between our bed issues and our carbon footprint we feel that this project has highlighted the large amount of Co2 and money wasted which could be potentially saved by refreshing our processes to address this problem.

References:

- 'Golden Patient': A quality improvement project aiming to improve trauma theatre efficiency in the Royal Gwent Hospital - PubMed (nih.gov)
- Golden Patients | Blackpool Teaching Hospitals NHS Foundation Trust (bfwh.nhs.uk)
- Air pollution, health and cancer – a new report calls for action - Cancer Research UK - Cancer news
- Every breath we take: the lifelong impact of air pollution | RCP London
- NHS England » Greener NHS campaign to tackle climate 'health emergency'

Appendix 1: Staff Survey

As part of the green team competition, we are looking for colleagues to complete this anonymous questionnaire regarding cancellation and delays within the department

Cancellation and Delays Staff Impact for Green Competition

Please circle your answer

1.Cancellations are a problem in my department. Yes no

If yes, what impact do they have?

I manage to catch up on training / Admin activities

I took some holiday hours

It interrupted my day

It frustrated me

Other:_____

2.Dealys are an issue in my department Yes no

If yes, what impact

I manage to catch up on training / Admin activities

I took some holiday hours

It interrupted my day

It frustrated me

Other:_____

3. Could you see any of the following as a solution to cancellations / Delays?

Confirmation of Beds the day Before Surgery

Patient Priority from day before

Different distribution of CCU Ward and IPU bed requirements during (e.g., More IPU Cases each day to reduce the pressure on Wards and CCU)

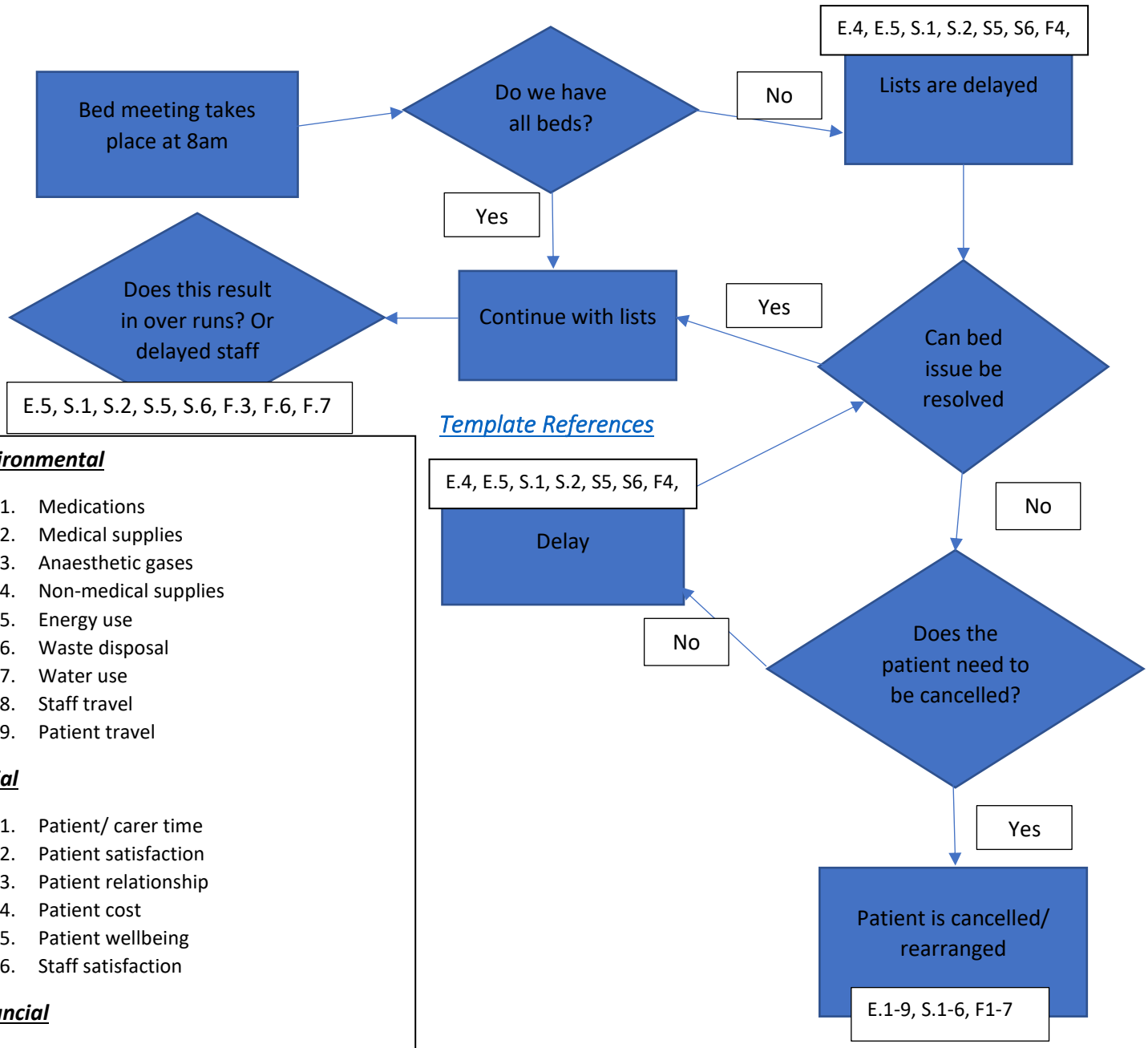
Other:_____

4. What impact do you feel cancellations have on our carbon footprint?

5. Do you feel our current bed situation is sustainable? Why?

Appendix 2: *Process Planning Example* – Bed Management Decisions on Morning of Surgery

Current Process – Bed managers assess available beds across the hospital along with staffing numbers and call theatres around 8am to update us on the bed availability for our surgical patients. Patients arrive at DOSA from 7am.



Environmental

1. Medications
2. Medical supplies
3. Anaesthetic gases
4. Non-medical supplies
5. Energy use
6. Waste disposal
7. Water use
8. Staff travel
9. Patient travel

Social

1. Patient/ carer time
2. Patient satisfaction
3. Patient relationship
4. Patient cost
5. Patient wellbeing
6. Staff satisfaction

Financial

1. Medications
2. Supplies
3. Energy use
4. Waste disposal
5. Water
6. Staff time
7. Bank staff

Appendix 3: Proposed Process – Day before surgery bed assessment, assigning golden patient and escalation of anticipated problems.

Day before surgery 15:30 – Bed meeting takes place following the scheduling meeting which confirms the next day's lists; **the golden patient is assigned and bed availability for the next day is discussed using traffic light system**. If any issues or potential issues are present, they should be discussed in detail clarifying how big the issue is using traffic light system and exactly what the problem is to avoid interpretation.

Green – **The ward has up to -3 beds.** This is likely to be resolved by next day discharges, theatres do not expect to experience delays the following day and do not need to escalate. **To improve efficiency** can additional golden patient beds be assigned.

Amber – **The ward has up to -6 beds**. This may cause delays the following morning but is likely to be resolved by the next day discharges. **Escalation steps to be taken to avoid morning delays.**

1. Escalate to Band 7 and 8 to inform scope of potential issues
2. Can the post-surgical wards be supported by other wards? / Could the discharge lounge be opened for the following day to streamline discharge process and free up bedspaces? / is additional medical support required on post-surgical wards for example to have patients reviewed or medications prescribed? / Can take home medications be ordered in advance?
3. Can lists orders be changed to minimise morning delays due to beds for example moving non-bed dependant cases first such as IPU patients or inpatients to start list.

Red – **The ward has -8 and above beds available.** This will cause delays in confirming beds and potential need for cancellations. Escalation process should be initiated –

1. Band 7 and 8 in theatres informed of scope of problem
2. Escalated to service managers
3. Priority list created by consultant or appropriate deputy
4. Support sought from other wards/ additional staffing requested /discuss if discharge lounge can be opened/can additional medical support to review patients be provided on wards to aid discharges?
5. Theatres informed of expected morning delay and information disseminated (equipment should not be opened until bed confirmation received)
6. Can theatres lists be changed to start with non-bed dependent surgery for example day case patients or inpatients.
7. If problem cannot be solved is a cancellation necessary? Discussion to take place between service managers and consultants. In un-resolvable circumstances could patient be informed in advance to avoid unnecessary travel and hospital intervention?

Day of Surgery - Golden patient/patients to be sent for without waiting for further confirmation on the morning of surgery.

When Green – theatre team to set up fully as waiting for bed confirmation

When Amber – theatre team to set up basic equipment whilst waiting for bed confirmation

When Red - theatres to set up but avoid opening single use items or pharmaceuticals until bed confirmation is received. Priority list prepared the day before surgery to be used to send for patients in order as beds are confirmed.

Patient flow to update theatres at **08:00** of updated bed status and confirmation