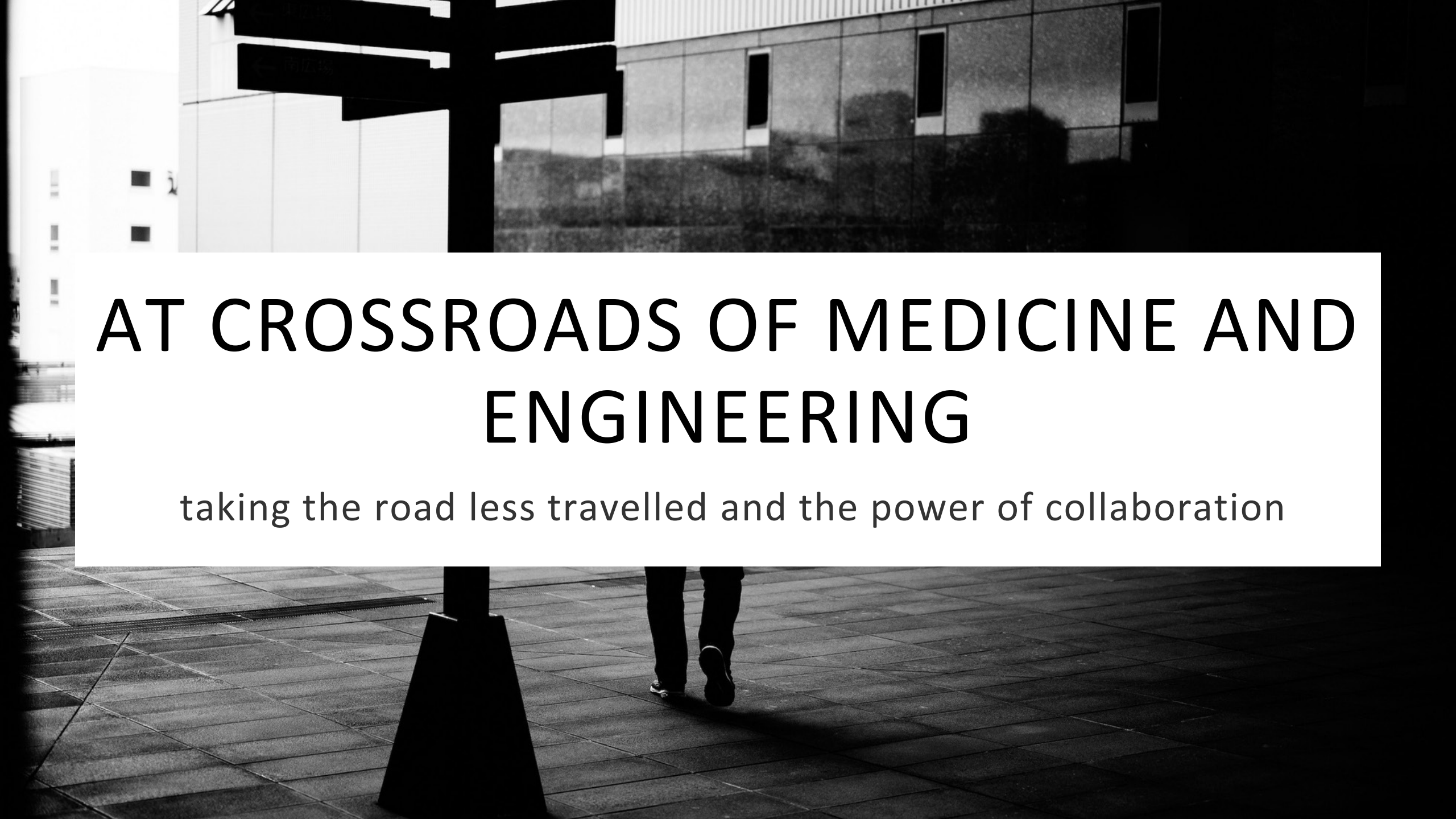


# AT CROSSROADS OF MEDICINE AND ENGINEERING

taking the road less travelled and the power of collaboration

# WHAT IS COMMON BETWEEN A HEALTHCARE PROFESSIONAL AND AN ENGINEER ?

Analytical skills

Problem Solving

Making things work better or make people better

Caring for humans

Organising and restoring order

Wanting to make this world a better place

What does Human Factors and Safety mean to you ?

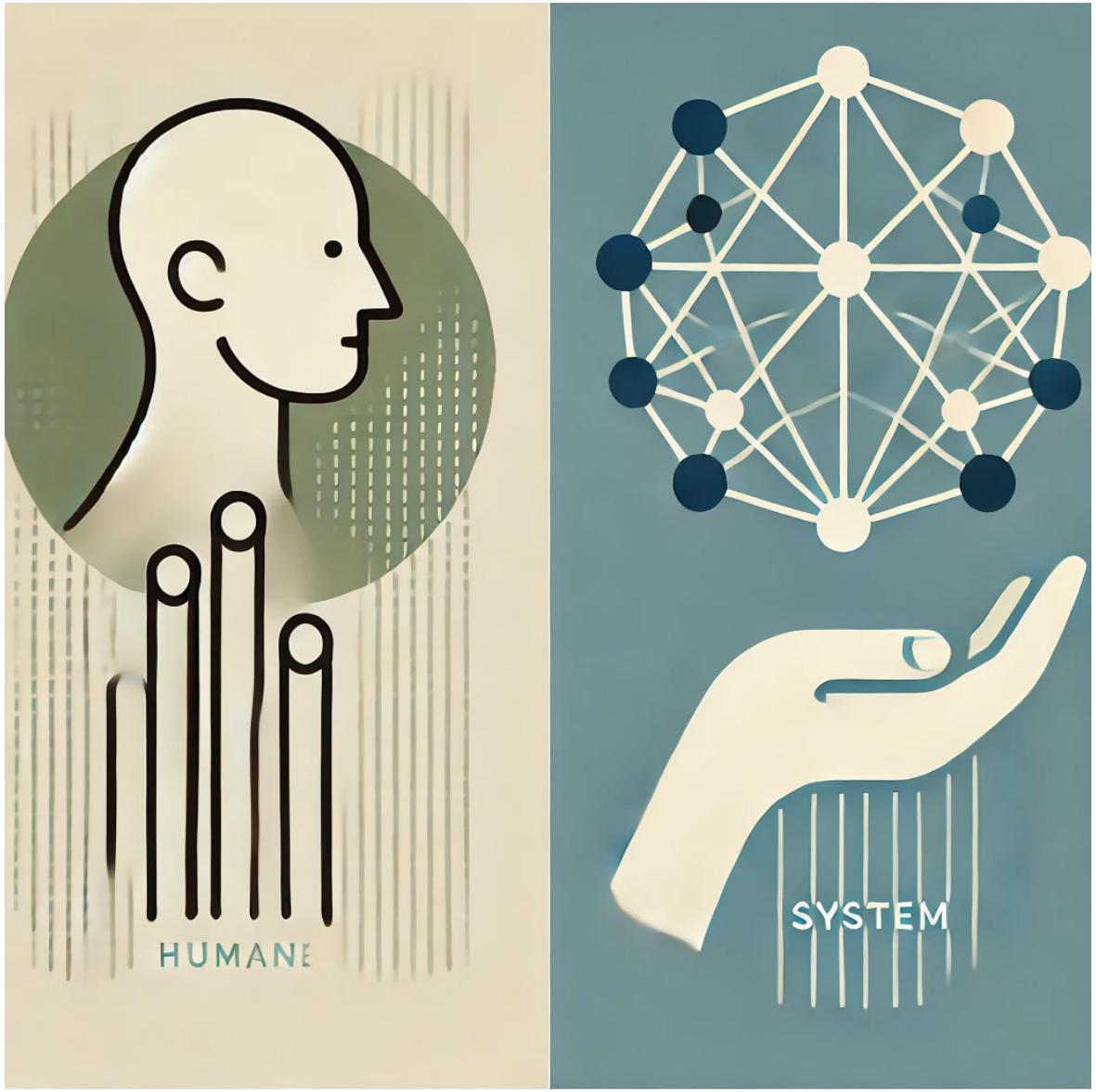

- **Group of Engineers**

# What does Human factors and Safety mean to you ?


**- Healthcare professionals**

Human Reliability

System Resilience



# Christine's story

*First-time mum* *baby boy* by *forceps birth*

She just 'didn't feel right'

Severe discomfort and could not pass urine properly

Saw her GP twice ....community midwife twice.

Had pain-killers and short course of antibiotics for suspected urine infection

16 days after she was discharged ,

She felt she passed a clot, but this was a vaginal swab.

By this time, she had developed *Sepsis*

Her problems continued for a few months. Mum and baby are fine now

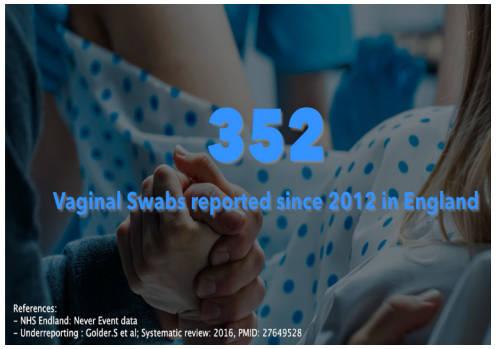
The registrar involved left the specialty.

# Never events are rare, but effects can be undesirable

# Are considered indefensible

2012- 22

near misses a lot more common




88 % of the time when a swab was retained, the documentation showed that count was correct (falsely)

Swabs are the single commonest item retained –

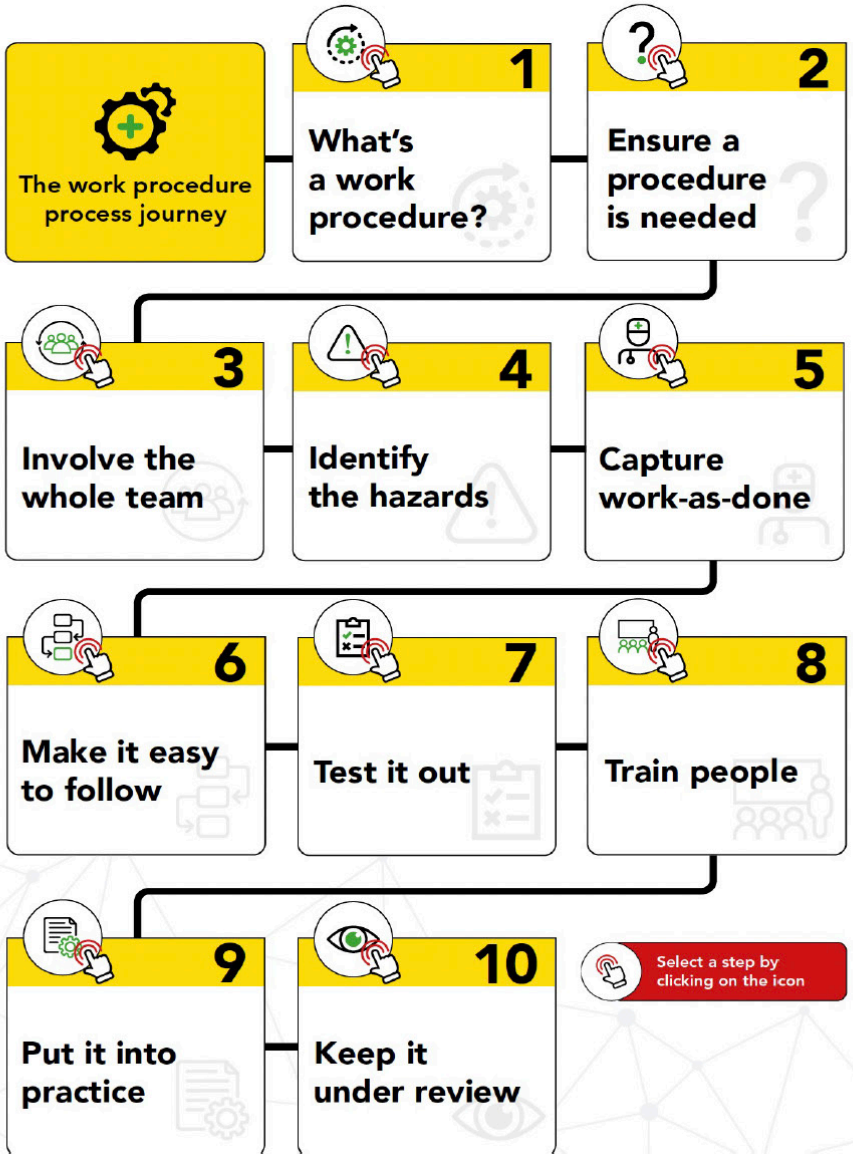
In UK vaginal swabs commonest

Underreporting known

First reported 1884 Dr Wilson and still remains a problem

# Ten key steps to design work better

Make your work procedures **safe** and **easy-to-use** for person-centred care




# SEIPS 2.0 framework used to map the counts process - traditional/iCount embedded within

## Tools and Technology

- Swabs held together with a red string in procedure packs OR separate packs
-Whiteboard for documenting count pre- and post-procedure
-Obstetric information system available on handheld iPads

- iCount docking device and swabs +/- software to integrate with electronic medical records

## Environment

Labour room
- Limited space for patient, family members, baby resuscitaire
- Labour is dynamic and unpredictable
-Additional equipment may be brought into room
(e.g. assisted birth with forceps)

-Delivery suite may be noisy and distracting
-Theatre : Patient may be transferred there with swab in situ (in the vagina)

## Processes

Physical-Cognitive-Social

Vaginal birth
- Collaborative work
- Indirect involvement - patients/ carers

Traditional Swab Count process -
Person conducting delivery/perineal repair.
Counter-check done by assistant (not an independent check).
Whiteboard documentation to confirm done by assistant

iCount-
Visual reminder - physical checklist.
Clip remains outside vagina- reminder for staff and patient. Computer vision check of count tally.
Software integrated with electronic medical records will recognise and allow completion of birth episode.

## Outcomes

Reduction in retained swabs positively affects patients, staff and organisation:

Proximal outcomes -
safer births,
collaboration,
safety culture

Distal Outcomes -
Patient experience, trust,
Team job satisfaction
Optimal Key performance,
lower litigation,
high reputation
long-term cost-saving

## Patient

experience,
workload ,
time of the day

Team: Midwives, Maternity Support Workers
Obstetricians (postgraduate doctors and Consultants)
Anaesthetists
Midwife coordinator

## Tasks

Get procedure pack/ swab packs in preparation for vaginal birth.
- 2 person checking count ,
- Whiteboard documentation before and after.
- With iCount - check all plugged in (+/- computer vision bar-code check on pack).
-Post procedure computer vision check and upload to electronic records
- Software completes birth episode.

## Organisation

Providing strategic leadership and management:
- Policies - LocSSIP*

- Resources required for a safe count practice

- Staff rosters, shift patterns and staff numbers for safe working

- Good work culture

External environment: Retained swab classed as a patient safety incident – never event. -National Safety Standards of Invasive Procedures (NatSSIPS),
-Postnatal care guidelines,
-Funding, procurement policies

*LocSSIP- local safety standards in invasive procedures

# Main Causative and contributory factors

- *Swabs change shape and colour*, can become sticky and look like body organs
- *Confirmation bias* during 2-person counts
- *Change in the team either within the labour room or if the patient is transferred to theatre*

Contributory :

- Competing task priorities
- Inadequate staff
- Environmental factors- ambient noise, low light conditions, masks, gowns

Two sides of the coin working together

## -Encouraging Human Behaviour

- Policies and Procedures
- Training
- Civility
- Situational awareness
- Teamwork
- Communication

## Design and System Engineering

Design solution :

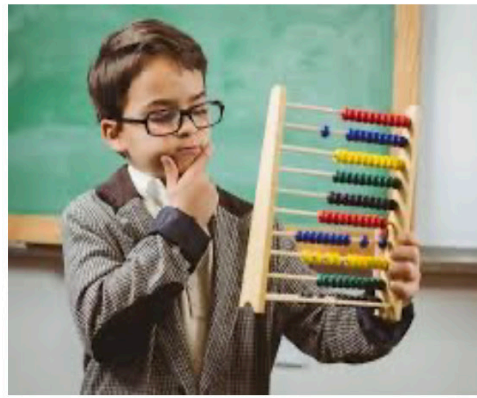
*Aim- Task aid which acts as a counter minimising the risk of retention*

Identify design specifications

User-centric Design

Design- Build – test iterative cycles

# Design specifications for maternity swab counter



**Must haves** :

Act as flags (signifiers) for each swab/tampon

Be able to separate each swab/tampon

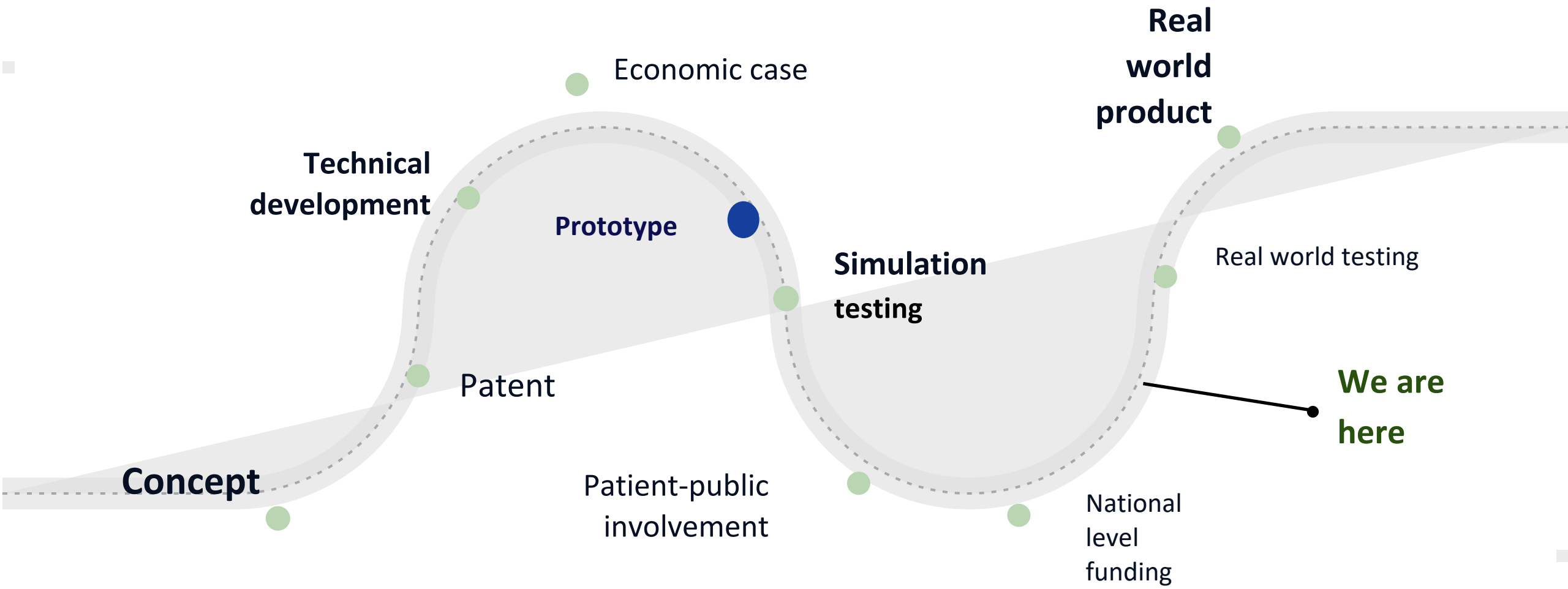
Show the correlation between how many in and how many out (Visualise the state of the system during the procedure as to how many swabs are out of the patient and docked in the device)

Count in 5s for count-out similar to count-in

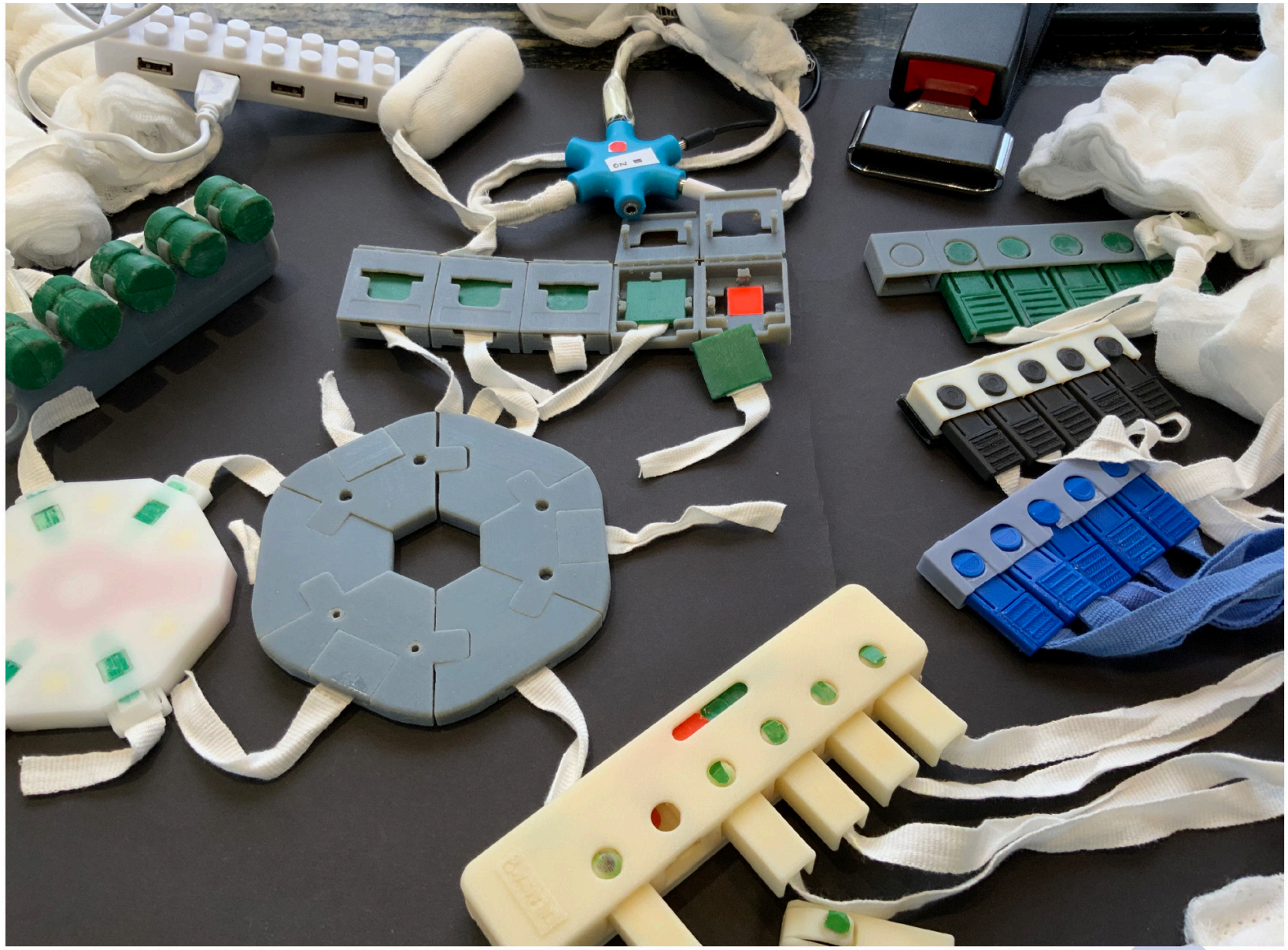
Low cost,  environment friendly

**Nice to have (currently in development and hope to introduce)**:

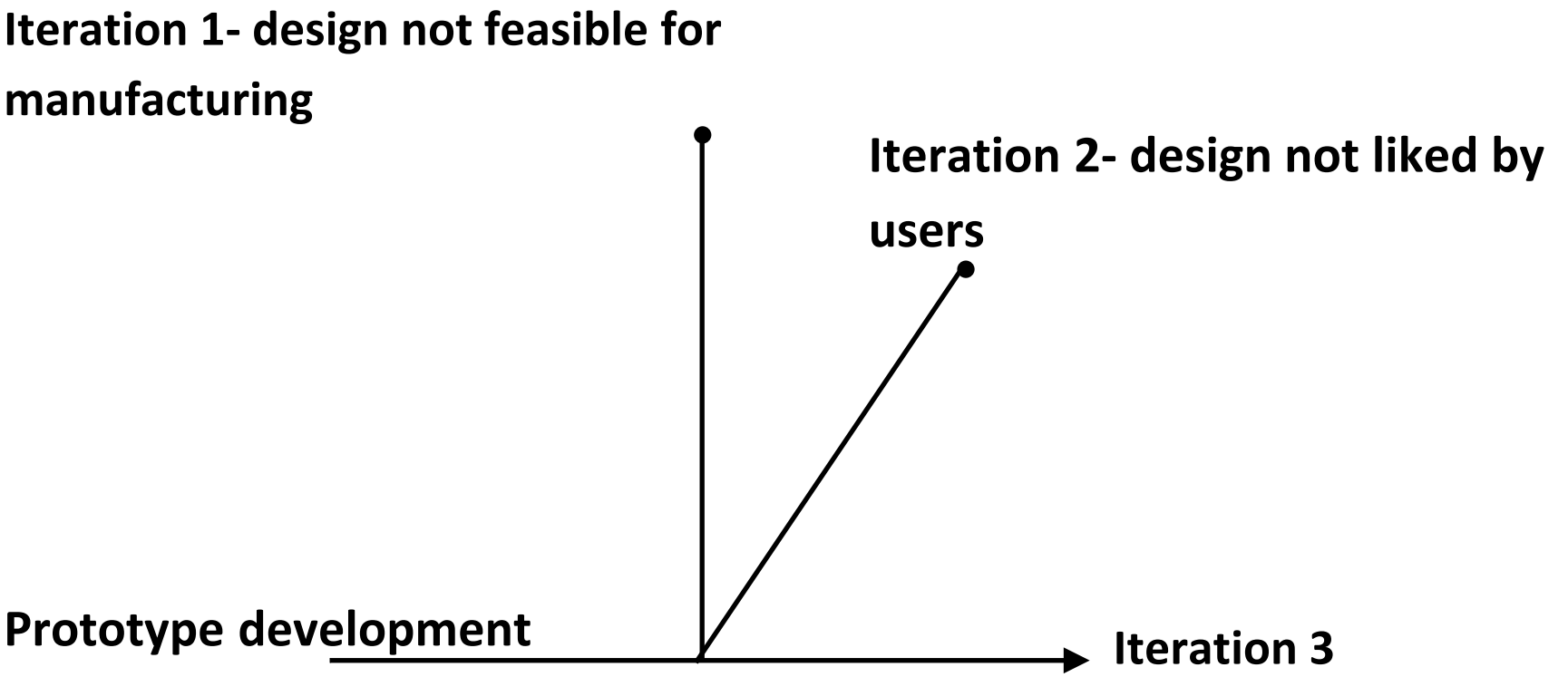
Integration with electronic medical records – Currently developing an app which correlates count in and count out with AI – computer vision. If count not accurate, will flag and not let the system close the episode (safety forced function as a strong systemic barrier)

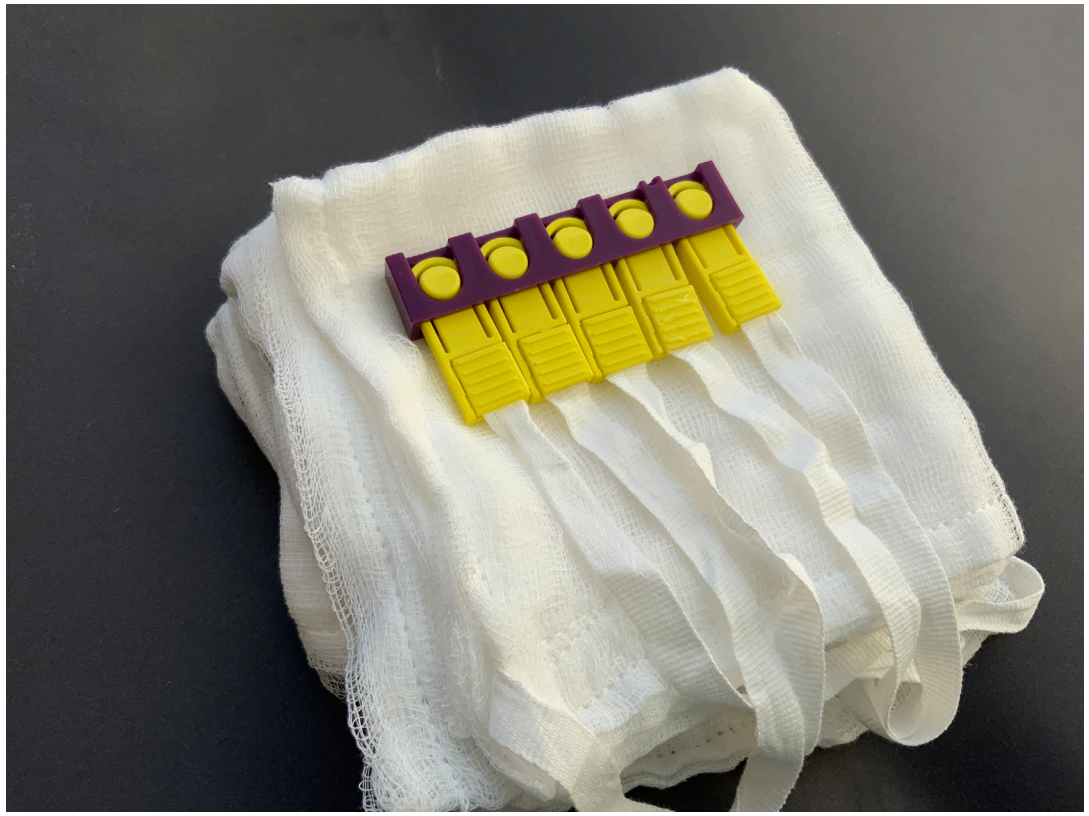

Concept
Patent
Technical development
Economic case
Prototype
Patient-public involvement
Simulation testing
National level funding
Real world product
Real world testing
We are here

# Journey



# This game is non-linear and there are no guarantees





13:05

Operation Details

**Pre-Op** 03/09/2024 16:41

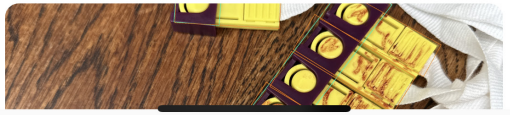
| | |
|---|---|
| Total Devices | 3 |
| Total Swabs | 15 |
| Attached Swabs | 15 |
| Empty Slots | 0 |
| Accuracy | 82.53% |

Was the result accurate? Yes

Add Additional Swabs

**Post-Op** 03/09/2024 16:42

| | |
|---|---|
| Total Devices | 3 |
| Total Swabs | 15 |
| Attached Swabs | 15 |
| Empty Slots | 0 |
| Accuracy | 83.40% |



BMJ innovations

Medical devices

# iCount: a human-factors engineered solution to vaginal swab retention — an early-stage innovation report

Ahmed Nader Elgharably [1], Kiran Desai [2], Alan Michael Nevill [3], Aaron Vance [4], Jon Lester [4], Emma Bonfiglio [5], Colin Rigby [6], Andrew Forrester [7], Peter Ogrodnik [8], Jeffrey Faint [9], Tom Clutton-Brock [10, 11], Aditi Desai [1, 2]

1. Obstetrics & Gynaecology, New Cross Hospital Wolverhampton Medical Institute, Wolverhampton, UK

2. Science and Innovations Park, Keele University, Eureka Inventions Limited, Keele, UK

3. University of Wolverhampton Faculty of Education Health and Wellbeing, Walsall, UK

4. School of Engineering, Computing and Mathematical Sciences, University of Wolverhampton Faculty of Science and Engineering, Wolverhampton, UK

5. Keele Research and Innovation Support Programme (KRISP) and the SMART Innovation Hub, Keele University, Newcastle-under-Lyme, UK

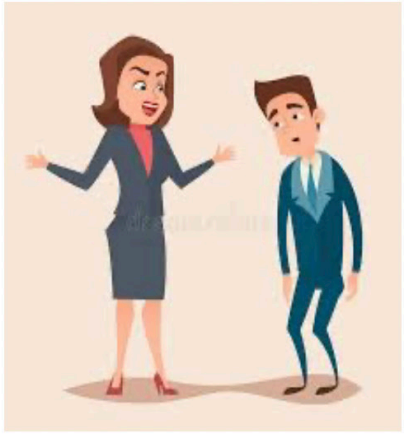
We cannot change human nature
(we all make mistakes),

but we can change the *conditions*
under which people operate to
make mistakes *less likely*,
*easier to detect*, and
*easier to correct*.

-Prof James Reason

# Culture change towards a ‘systems thinking’ approach

Counts are the midwife’s or doctor’s job.
If a swab is retained, they have not followed policy.
Its their fault !



The cause of incidents is multifactorial,
and staff are accountable.
But how do we make it easier for staff to do the right thing?


**Mapping action ne**

- Engaging stakehol
- Adoption sites
- Training package
- Champions
- Measuring impact

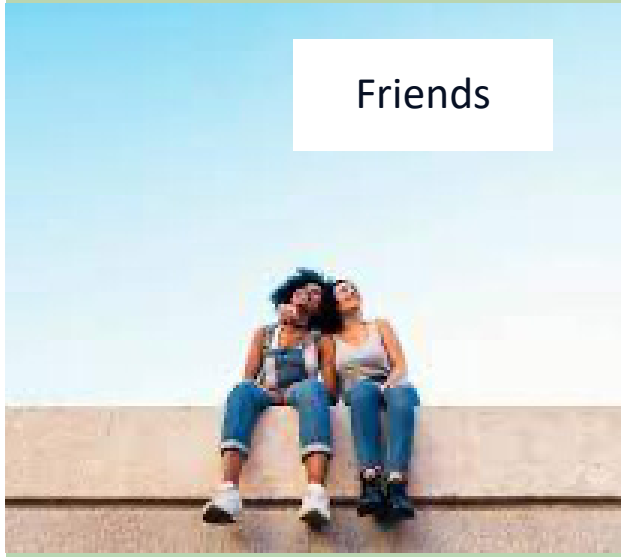
Staff confidence

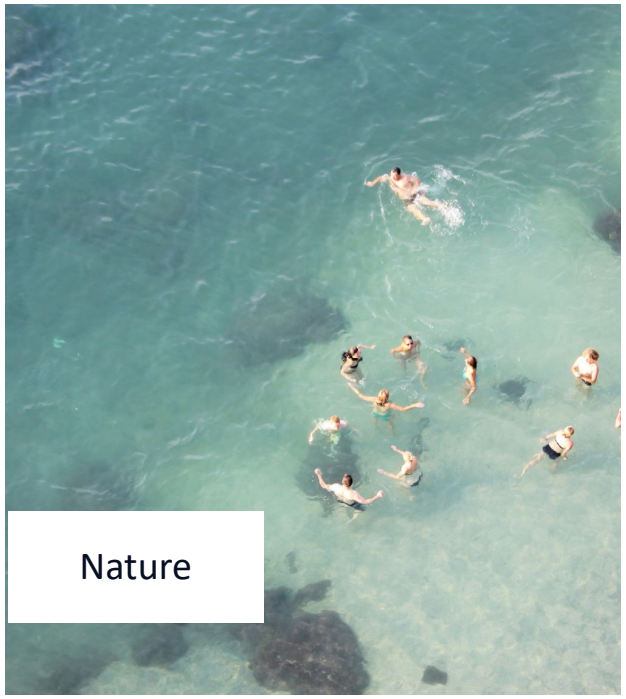
Near misses

Electronic medical r

Retention incidents

Family

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