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# Learning from sentinel events in healthcare



Kelly Bos, MD PhD candidate  
Amsterdam UMC – location AMC



Before patient leaves operating room

## TIME OUT

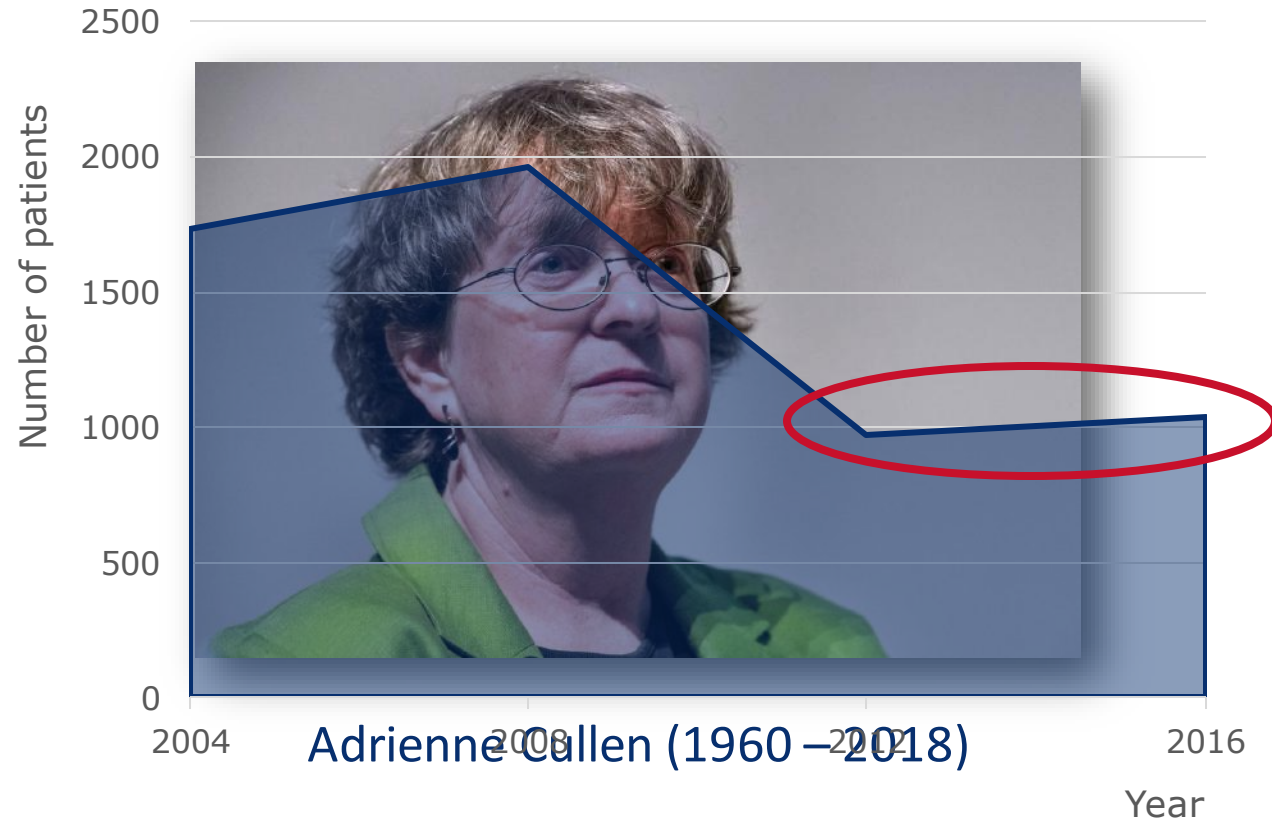
- ☐ CONFIRM ALL TEAM MEMBERS HAVE INTRODUCED THEMSELVES BY NAME AND ROLE
- ☐ SURGEON, ANAESTHESIA PROFESSIONAL AND NURSE VERBALLY CONFIRM
  - PATIENT
  - SITE
  - PROCEDURE

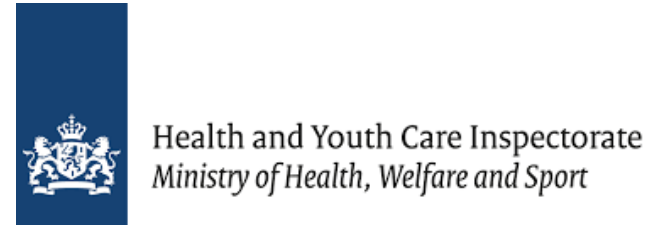
NURSE VERBALLY CONFIRMS WITH THE TEAM:

- ☐ THE NAME OF THE PROCEDURE RECORDED
  - ☐ THAT INSTRUMENT, SPONGE AND NEEDLE COUNTS ARE CORRECT (OR NOT APPLICABLE)
  - ☐ HOW THE SPECIMEN IS LABELLED (INCLUDING PATIENT NAME)
  - ☐ WHETHER THERE ARE ANY EQUIPMENT PROBLEMS TO BE ADDRESSED
- 
- ☐ SURGEON, ANAESTHESIA PROFESSIONAL AND NURSE REVIEW THE KEY CONCERNS FOR RECOVERY AND MANAGEMENT OF THIS PATIENT



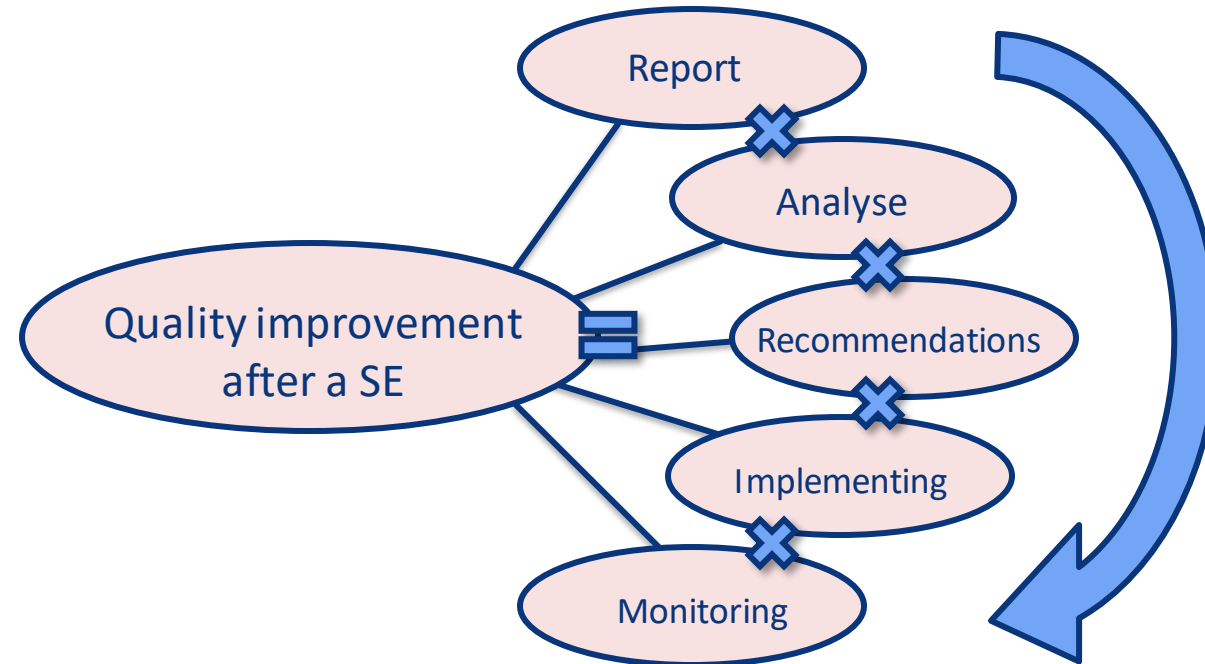
# Potentially avoidable mortality



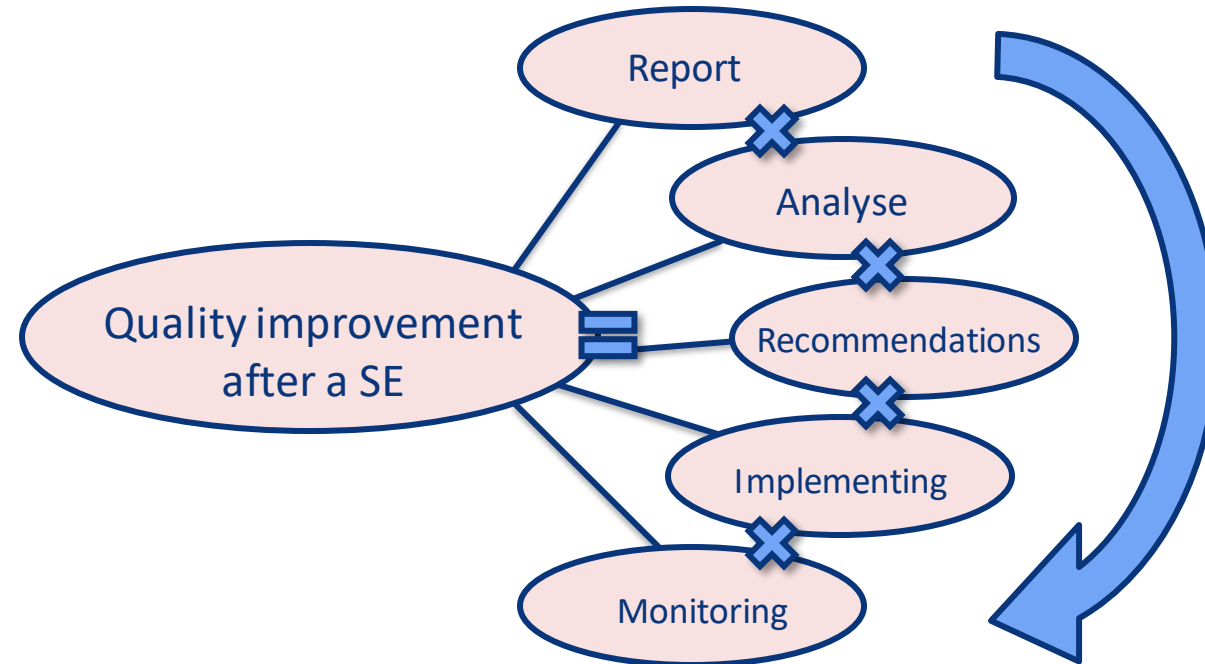




# Quality improvement



# Quality improvement



# Sentinel event

A patient dies due to severe kidney failure after prescribing a nephrotoxic antibiotic in a high dosage

Recommendation:

The case will be discussed within the department





# Situation in the Netherlands

Not all recommendations following incident analysis seem to lead to sustainable solutions

The case will be discussed within the department

The protocol will be adjusted

Reconfirm the existing agreements



# Method

- Literature
- Expert opinion

# Filter

Criteria:



The goal needs to be clear and the recommendation has to specifically describe what will be adjusted, changed or replaced

It has to reduce the chance of the unwanted event to occur or limit its consequences

# Sentinel event

A patient dies due to severe kidney failure after prescribing a nephrotoxic antibiotic in a high dosage

Recommendation:

The case will be discussed within the department



# Filter

3 medical doctors

10 sentinel events

38 recommendations

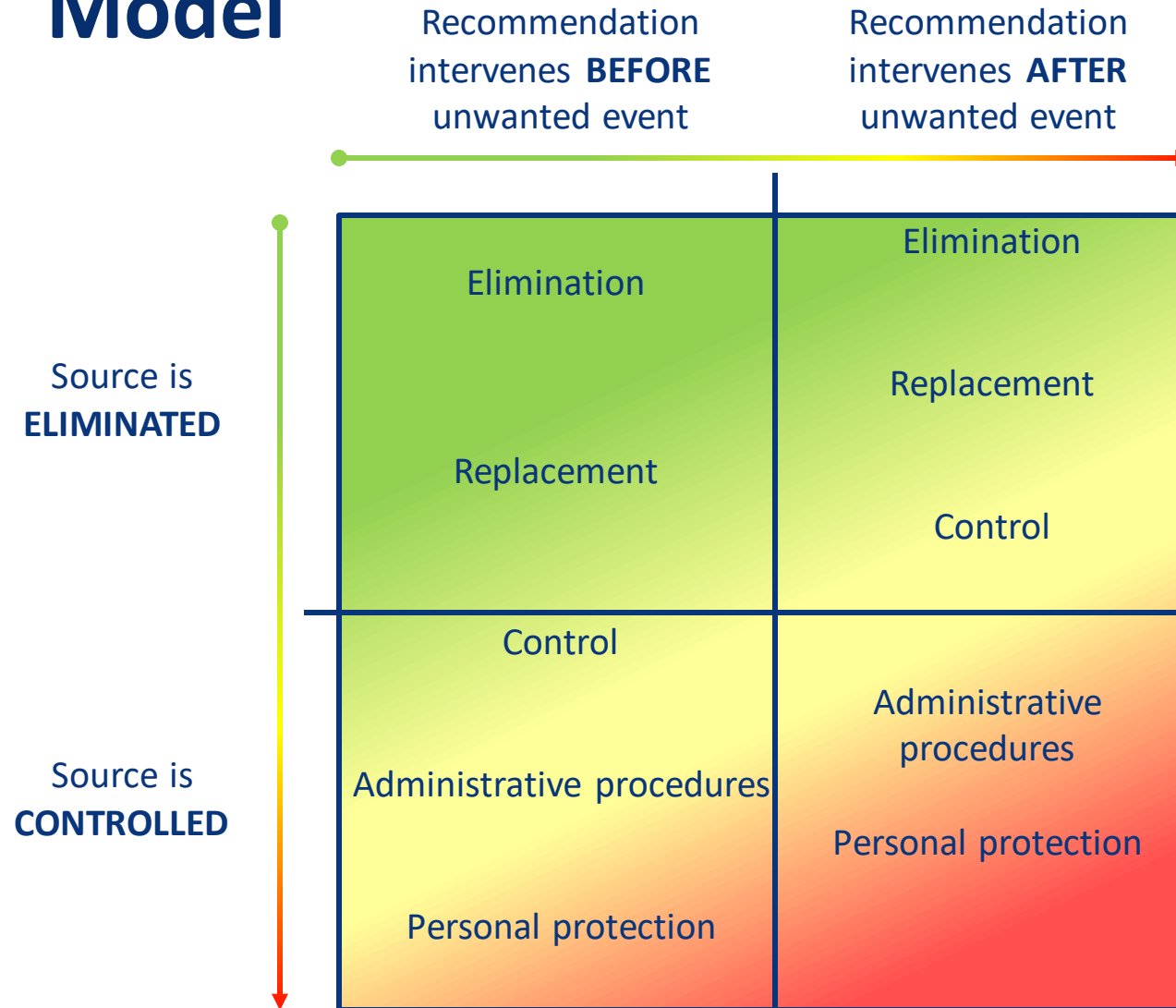
45% (17/38) actual recommendation

# Method

- Systematic review
  - 11 methods
    - Subjective assessment
    - Not user-friendly
    - Only one validated
- Expert consensus meetings



# Model



# Sentinel event

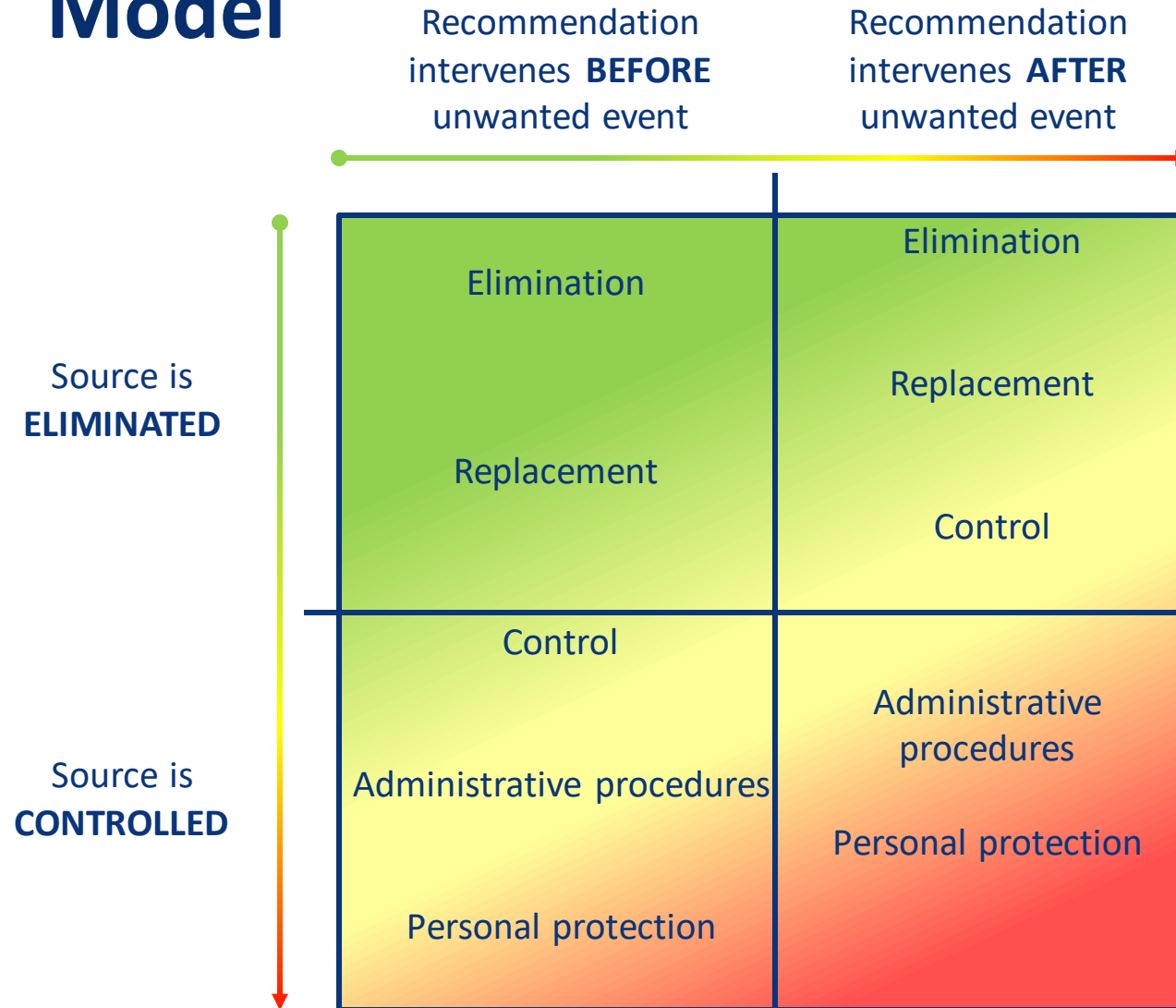
A patient dies due to severe kidney failure after prescribing a nephrotoxic antibiotic in a high dosage

Recommendation:

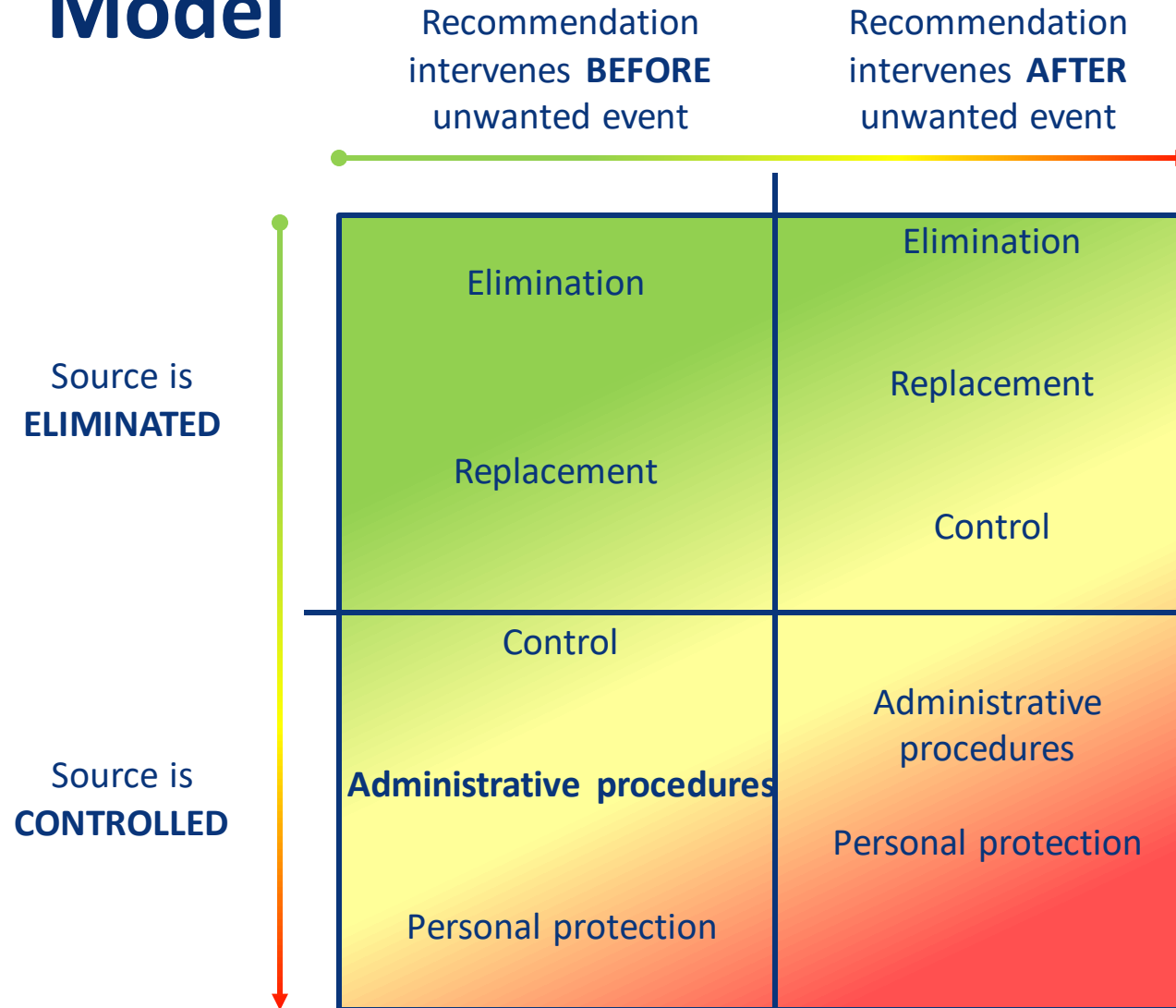
Send every resident a list of all nephrotoxic antibiotics



# Model



# Model



# Model

3 medical doctors

4 inspectors

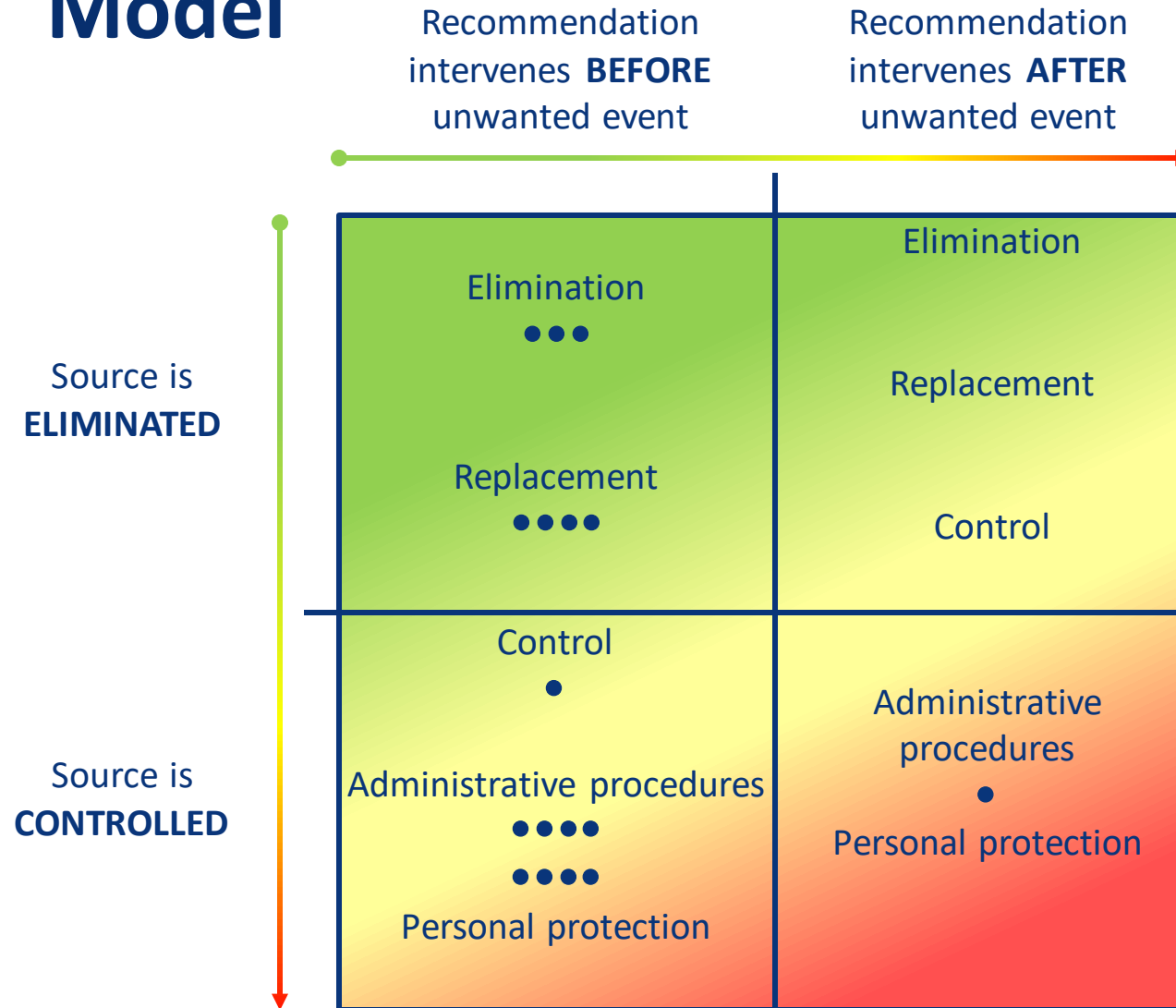
9 sentinel events

17 recommendations

53% (9/17) directly the same outcome

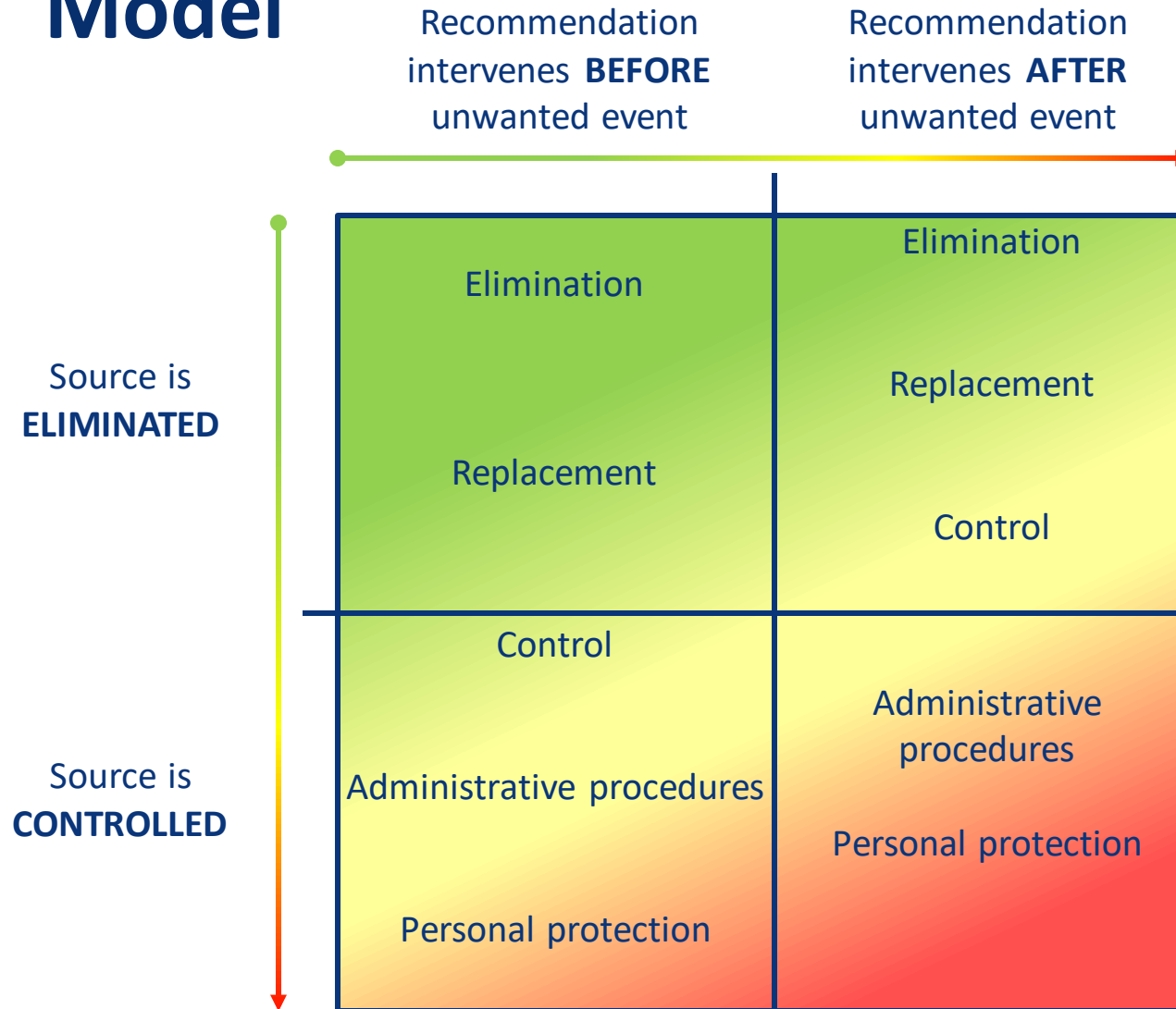
47% (8/17) consensus after consideration

# Model





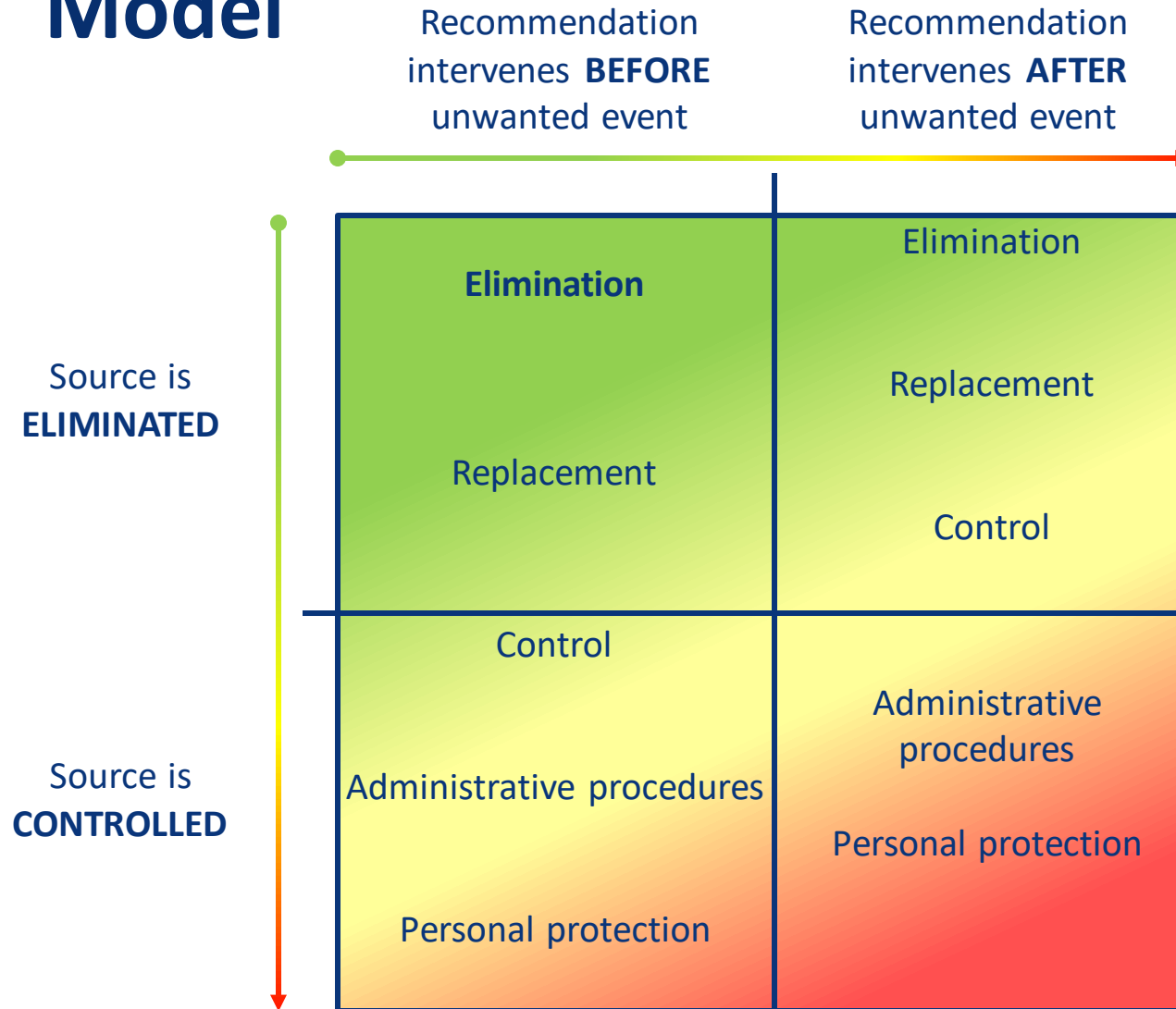
# Model



## Unwanted event:

A patient dies due to severe kidney failure after prescribing a nephrotoxic antibiotic in a high dosage for several days

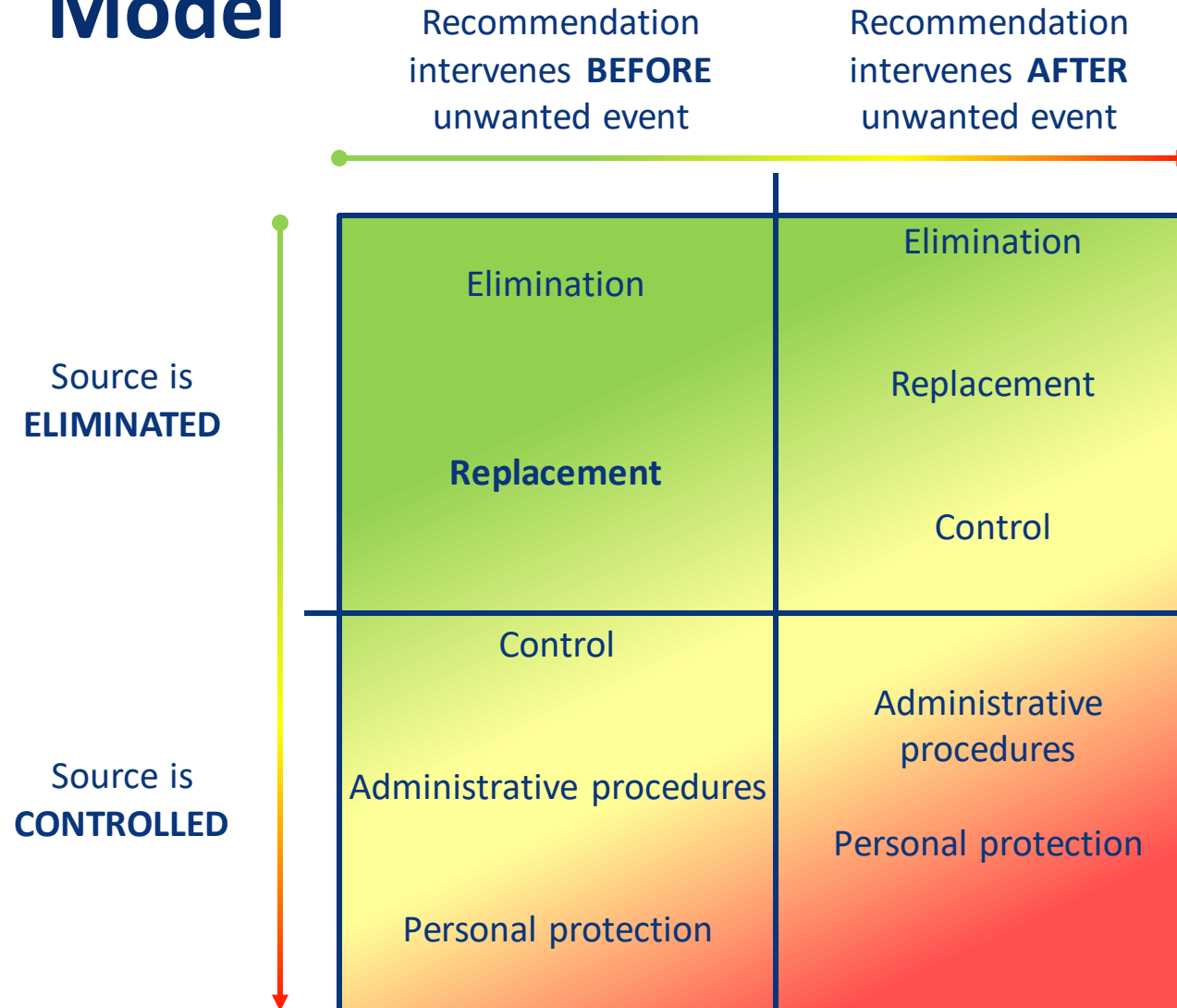
# Model



## Unwanted event:

A patient dies due to severe kidney failure after prescribing a nephrotoxic antibiotic in a high dosage for several days

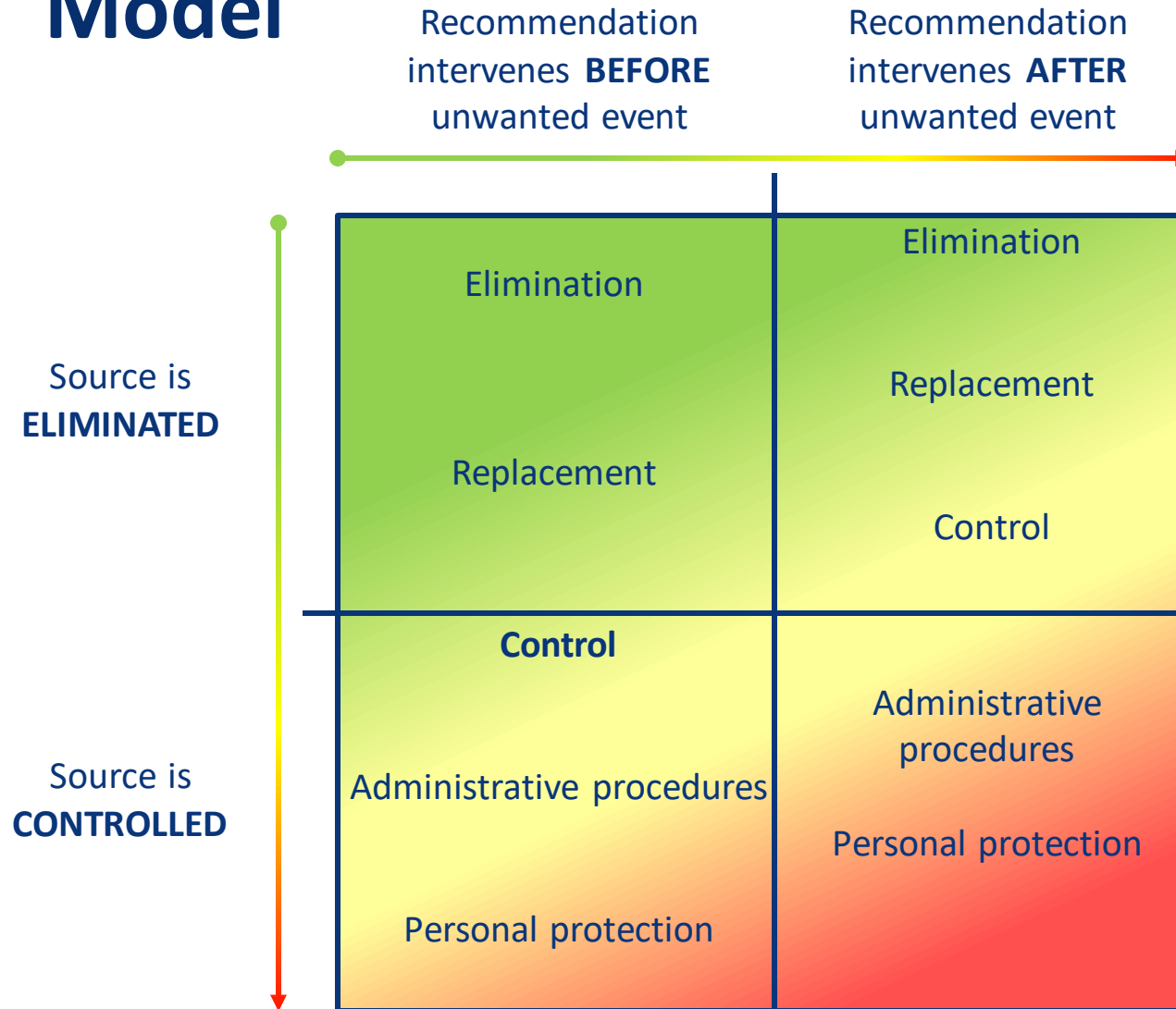
# Model



## Unwanted event:

A patient dies due to severe kidney failure after prescribing a nephrotoxic antibiotic in a high dosage for several days

# Model



## Unwanted event:

A patient dies due to severe kidney failure after prescribing a nephrotoxic antibiotic in a high dosage for several days

# Summary

A recommendation needs to fit the criteria of a recommendation

The model gives insight in the quality of recommendations in a more objective manner and therefore contributes in selecting and prioritising high quality recommendations for implementation

# Future perspectives

Increasing learning capacity

Sharing best practices

Culture

Human factors



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# Method

## Systematic review

### Aspects of 4 methods

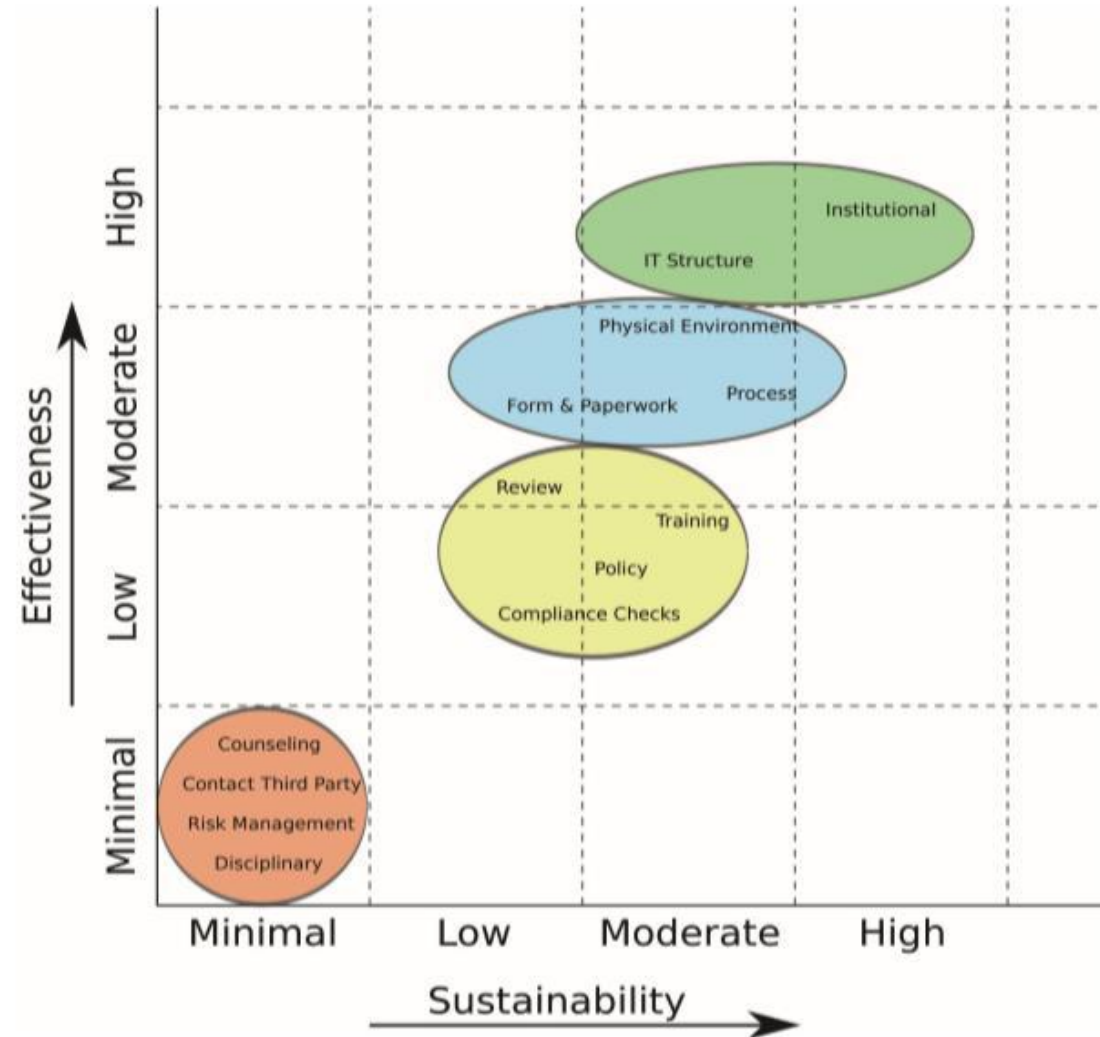
1. De Dianous V, Fiévez C. ARAMIS project: a more explicit demonstration of risk control through the use of bow-tie diagrams and the evaluation of safety barrier performance. J Hazard Mater. 2006;130(3):220-233
2. Hettinger AZ, Fairbanks RJ, Hegde S, Rackoff AS, Wreathall J, Lewis VL, Bisantz AM, Wears RL. An evidence-based toolkit for the development of effective and sustainable root cause analysis system safety solutions. J Healthc Risk Manag. 2013;33(2):11-20
3. McCaughan C, HSE Investigation Processes Working Group. Guideline for the systems analysis investigation of incidents. 2015(2):1-131
4. McLeod R, Randle I, Miles R, Hamilton I, Wilkinson J, Tomlinson C, Jun GT, Wynn T, CIEHF Working Group. Human factors in barrier management. Chartered Institute of Ergonomics & Human Factors. 2016:1-64

# Method

Table 1  
Typology of safety functions


Safety function	Definition	Example
To avoid	To make the event impossible	In the fault tree, to avoid an impact on a vessel
“To avoid” safety functions may only act upstream of any kind of event in such a way this event can never occur. The event is avoided by suppressing the intrinsic conditions that causes the event, by adding generally a passive, permanent, physical barrier. This kind of safety function cannot depend on the functioning of any other safety function		
To prevent	To hinder, to put obstacles on the way of occurrence of the event	In the fault tree, to prevent the corrosion of a vessel
In the event tree, to prevent the vapourisation of a pool, or to prevent the ignition of a flammable cloud		
“To prevent” safety functions may only act upstream of any kind of event in such a way the occurrence of this event is reduced (but not absolutely avoided). This safety function will only reduce (of one or more order of magnitude) the frequency of an event.		
To control	In the fault tree, to control = to bring back the system to a “safe” state	In the fault tree, to control the overfilling of a liquid storage
In the event tree, to control = to get the event under control and return to a “safe” state		
In the event tree, to control the pool dispersion		
“To control” safety functions may act upstream of an event in the fault tree (in response to a drift which may lead to the event and/or in response to upstream events—feedback, control loops). “To control” safety functions may also act downstream of an event in the event tree (the event occurred but can be definitively stopped). A part of this safety function is nearly always a detection		
“To limit” or “To reduce” or “To mitigate”	To limit = to limit the event in the time and/or in the space, or to reduce its magnitude, or to mitigate the effects of a dangerous phenomenon on the neighbouring equipment, on the human beings or on the environment	In the fault tree, to reduce the overpressure in the reactor
In the event tree, to reduce the liquid flow, to reduce the concentration of the toxic cloud, or to limit the duration of a leak, to limit liquid vapourisation		
“To limit” or “to reduce” or “to mitigate” safety functions may act downstream of an event. As a matter of fact, the event must have occurred to be limited or reduced or mitigated. It provides no control. A detection is sometimes part of the “limit” safety function		
These limitation functions can be of three different kinds. They can aim at limiting the amount of energy or hazardous substances or, more generally, the amplitude of dangerous phenomena constitutive of the critical event		

# Method

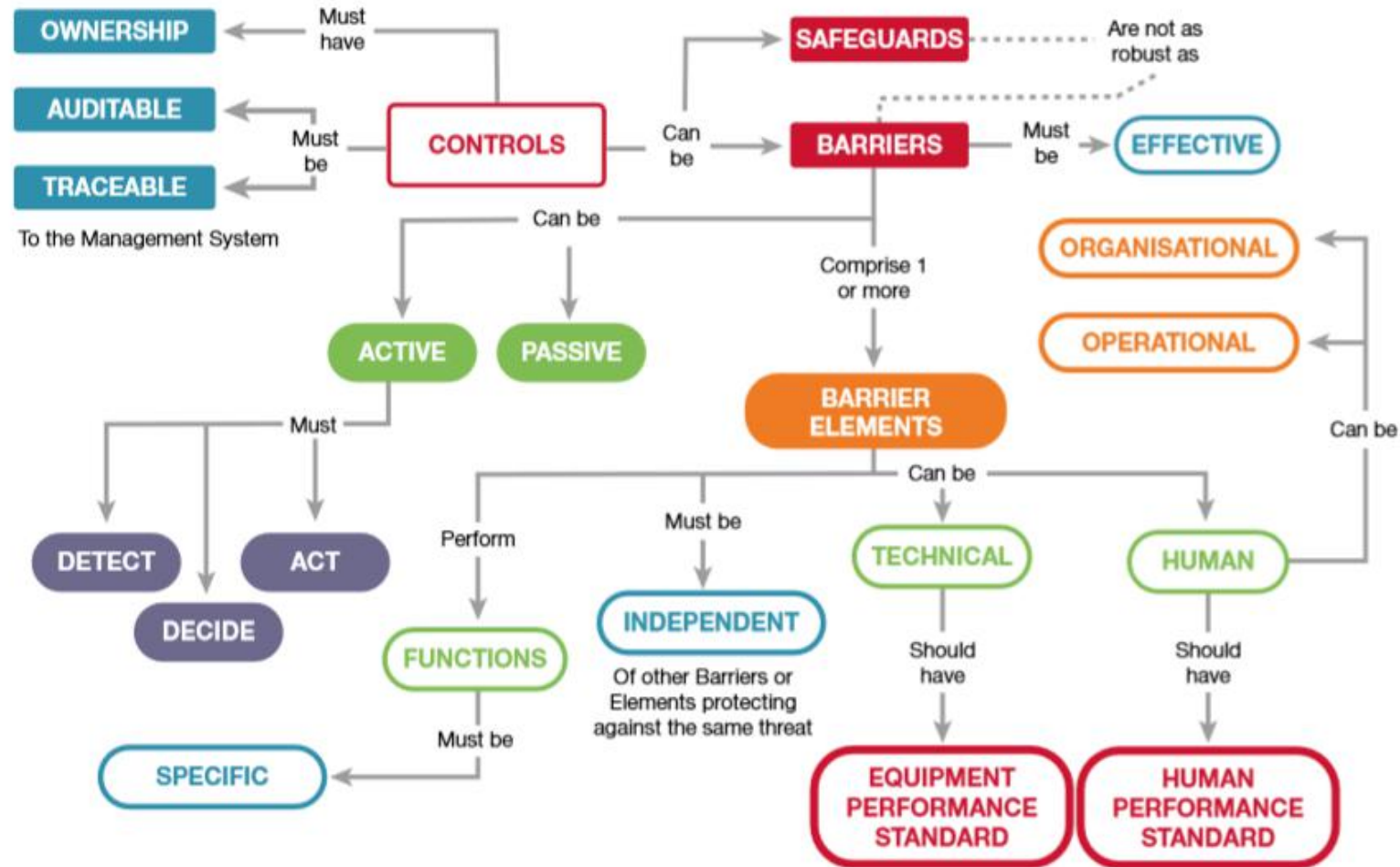




# Method

Strength of control	Category of Control	Comments/ Examples
<b>Strongest Control</b> 	Elimination	The work process or task is redesigned so as to remove the hazard/ contributory factor. However, the alternative method should not lead to a less acceptable or less effective process. Examples of controls may be to stop providing service; discontinue a particular procedure; discontinue use of a particular product, service or piece of equipment. <i>If hazard elimination is not successful or practical, the next control measure is substitution.</i>
	Substitution	Replacing the material or process with a less harmful one. Re-engineer a process to reduce potential for "human error". <i>If no suitable practical replacement is available the next control measure is engineering controls</i>
	Engineering Controls	Installing or using additional equipment. Introduce "hard" engineering controls e.g. installation of handling devices for moving and handling people and objects, e.g. Re-engineer equipment so that it is impossible to make errors. <i>If no suitable engineering control is available, the next control measure is administrative procedures.</i>
	Administrative Procedures	Ensure that administrative policies, procedures and guidelines are in place Ensure staff are appropriately trained in these Monitor compliance with policies, procedures and guidelines through audit <i>If no administrative procedure is available the next control measure is work practice controls.</i>
	Work Practice Controls	This is the last control measure to be considered. Change the behaviour of staff, e.g. make staff wear personal protective equipment, etc. <i>Work Practice controls should be only considered after all the previous measures have been considered and found to be impractical or unsuccessful</i>
<b>Weakest Control</b>		

# Method





# Method

## Systematic review

### 7 other methods

5. Brandrud AS, Haldorsen GS, Nyen B, Vårdal M, Nelson EC, Sandvik L, Hjortdahl P. Development and validation of the CPO scale, a new instrument for evaluation of health care improvement efforts. Qual Manag Health Care. 2015;24(3):109-120
6. Coburn AF, Wakefield M, Casey M, Moscovice I, Payne S, Loux S. Assuring rural hospital patient safety: what should be the priorities? J Rural Health. 2004;20(4):314-326
7. Flottorp SA, Oxman AD, Krause J, Musila NR, Wensing M, Goddycki-Cwirko M, Baker R, Eccles MP. A checklist for identifying determinants of practice: a systematic review and synthesis of frameworks and taxonomies of factors that prevent or enable improvements in healthcare professional practice. Implement Sci. 2013;8:35

# Method

## Systematic review

### 7 other methods

8. Geller ES, Berry TD, Ludwig TD, Evans RE, Gilmore MR, Clarke SW. A conceptual framework for developing and evaluating behavior change interventions for injury control. *Health Educ Res.* 1990;5(2):125-137
9. Mira JJ, Lorenzo S, Carrillo I, Ferrús L, Silvestre C, Astier P, Iglesias-Alonso F, Maderuelo JA, Pérez-Pérez P, Torijano ML, Zavala E, Scott SD, the research group on second and third victims. Lessons learned for reducing the negative impact of adverse events on patients, health professionals and healthcare organizations. *Int J Qual Health Care.* 2017;29(4):450-460
10. Rodriguez-Gonzalez CG, Martin-Barbero ML, Herranz-Allonso A, Durango-Limarquez MI, Hernandez-Sampelayo P, Sanjurjo-Saez M, iPharma. Use of failure mode, effect and criticality analysis to improve safety in the medication administration process. *J Eval Clin Pract.* 2015;21(4):549-559

# Method

## Systematic review

### 7 other methods

11. Testik OM, Shaygan A, Dasdemir E, Soydan G. Selecting health care improvement projects: a methodology integrating cause-and-effect diagram and analytical hierarchy process. Qual Manag Health Care. 2017;26(1):40-8

# Filter

Dyreborg J. et al. Safety Interventions for the Prevention of Accidents in the Work Place. 2011

Herrera-Sánchez IM. Steps to Ensure a Successful Implementation of Occupational Health and Safety Interventions at an Organizational Level. 2017;8:2135

Sklet S. Safety barriers: Definition, classification, and performance. Journal of Loss Prevention in the Process Industries. 2006;19(5):494-506

# Human Factor Issues in *Better Training, Better Births:* An evaluation study

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- Alison Gale
- Jacky Hanson
- Mike Davis



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Better Training, Better Births





# Declaration of Interests

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Production and delivery of the human factor training course was funded by the Lancashire and South Cumbria 'Better Training, Better Births' Consortium using a bursary from the Health Education England Maternity Safety Fund.

# Key messages

Successful educational intervention

Enthusiasm for roll out of programme to ALL staff

Identification of non technical skill improvements

Cultural challenge: development of strategies to enable good practice to be firmly embedded in day to day management in maternity care



# Background

Each baby counts, 2015 full report

Royal College of Obstetricians & Gynaecologists

## Individual human factors

Individual human factors other

Fatigue

Stress

Lack of team leadership

Lack of situational awareness

**Individual human factors total\***

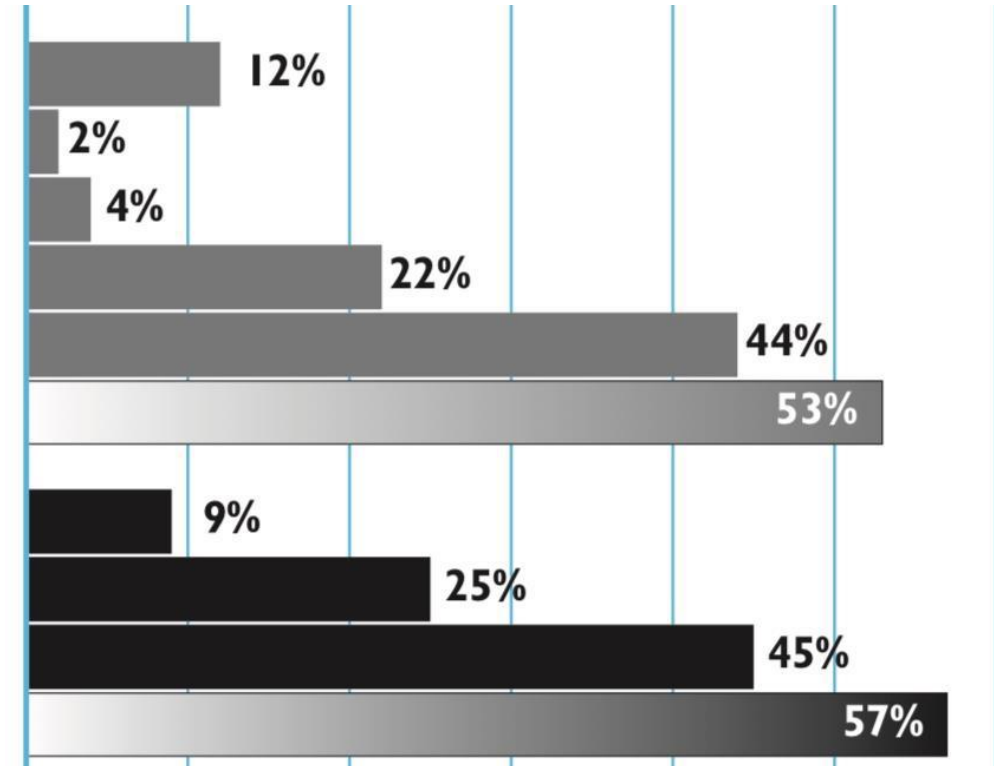
## Team communication issues

Team communication issues other

Poor record keeping/written documentation

Poor intra- or interprofessional communication

**Team communication issues total\***





# BTBB Programme strategy

## **Practical Obstetric Skills**

Shoulder dystocia  
Major obstetric haemorrhage  
Eclampsia  
Vaginal breech birth  
Maternal collapse  
Maternal sepsis  
Cord prolapse

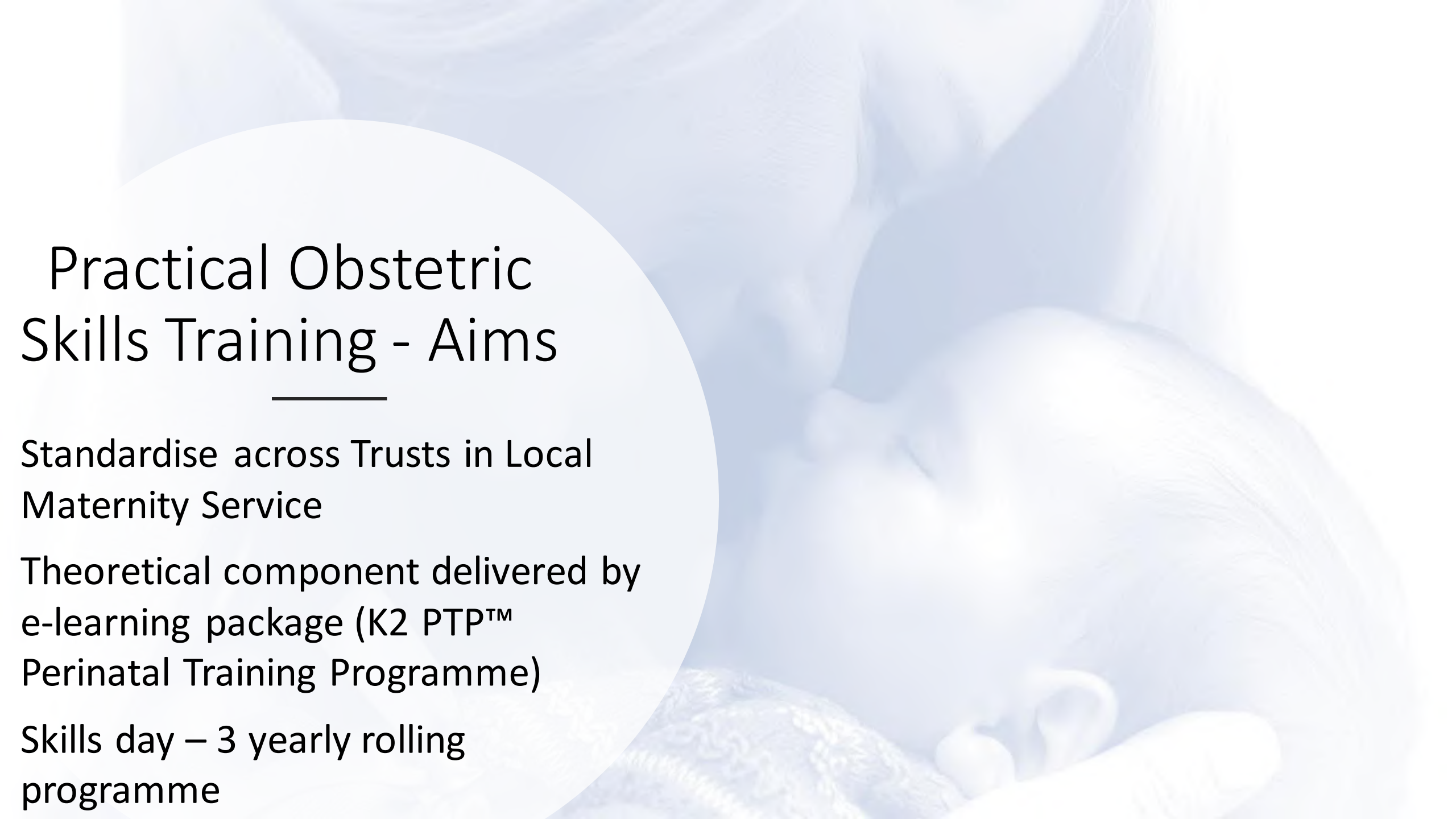
## **Bespoke Human Factor training:**

### *Non-technical skills*

Communication  
Situation awareness  
Decision making  
Leadership & teamwork

### *Wider human factors*

Systems analysis & error  
Stress/fatigue



# Practical Obstetric Skills Training - Aims

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Standardise across Trusts in Local Maternity Service

Theoretical component delivered by e-learning package (K2 PTP™ Perinatal Training Programme)

Skills day – 3 yearly rolling programme

# Practical Obstetric Skills: initial outcomes

Favourable reaction to training days  
Enjoy interaction with staff from other units

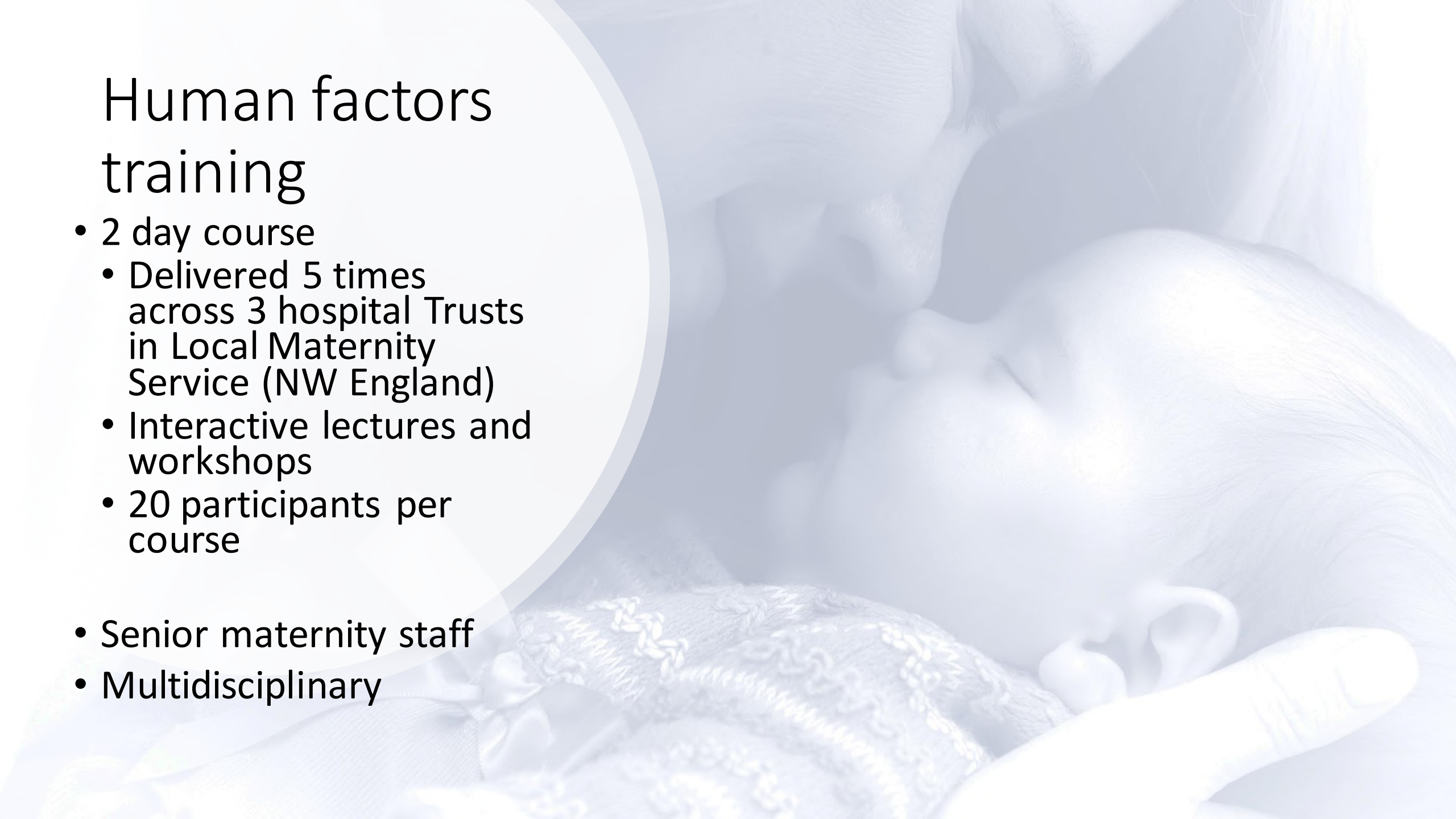
## *Incidental positives:*

Development of Practice Development  
Midwives network  
Collaborative working  
Sharing guidelines  
Benchmarking other areas of practice



# Human factors training

- 2 day course
  - Delivered 5 times across 3 hospital Trusts in Local Maternity Service (NW England)
  - Interactive lectures and workshops
  - 20 participants per course
- Senior maternity staff
- Multidisciplinary



# Evaluation Strategy

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Expanded Kirkpatrick's  
Hierarchy





# Evaluation Strategy

Post course satisfaction surveys

Invitations to engage in writing reflective accounts

Invitation to participate in small group semi-structured interviews





# Results – post course evaluation




## **Baseline attitudes towards HF issues**

Delegates claimed familiarity with human factors, but ...

Human factors training seen as a valuable intervention

Faculty felt that delegates were considerably less aware of NTS issues than they claimed



# Results – post course evaluation

## **Extent to which course met needs**

Very high levels of satisfaction with both presentation and content of course

Evaluation average 3.7/4 across 2 days


Open responses highlighted issues:

- HF analysis

- Resilience & stress

- Understanding of HF issues and challenges





# Results – post course evaluation



## **Pressing next steps**

Sharing HF analysis of incidents  
Team work and motivation  
Handover  
Reflection and personal learning  
Resilience



## Results – post course evaluation

### Challenges to implementing change

- 49 respondents reported cultural obstacles:

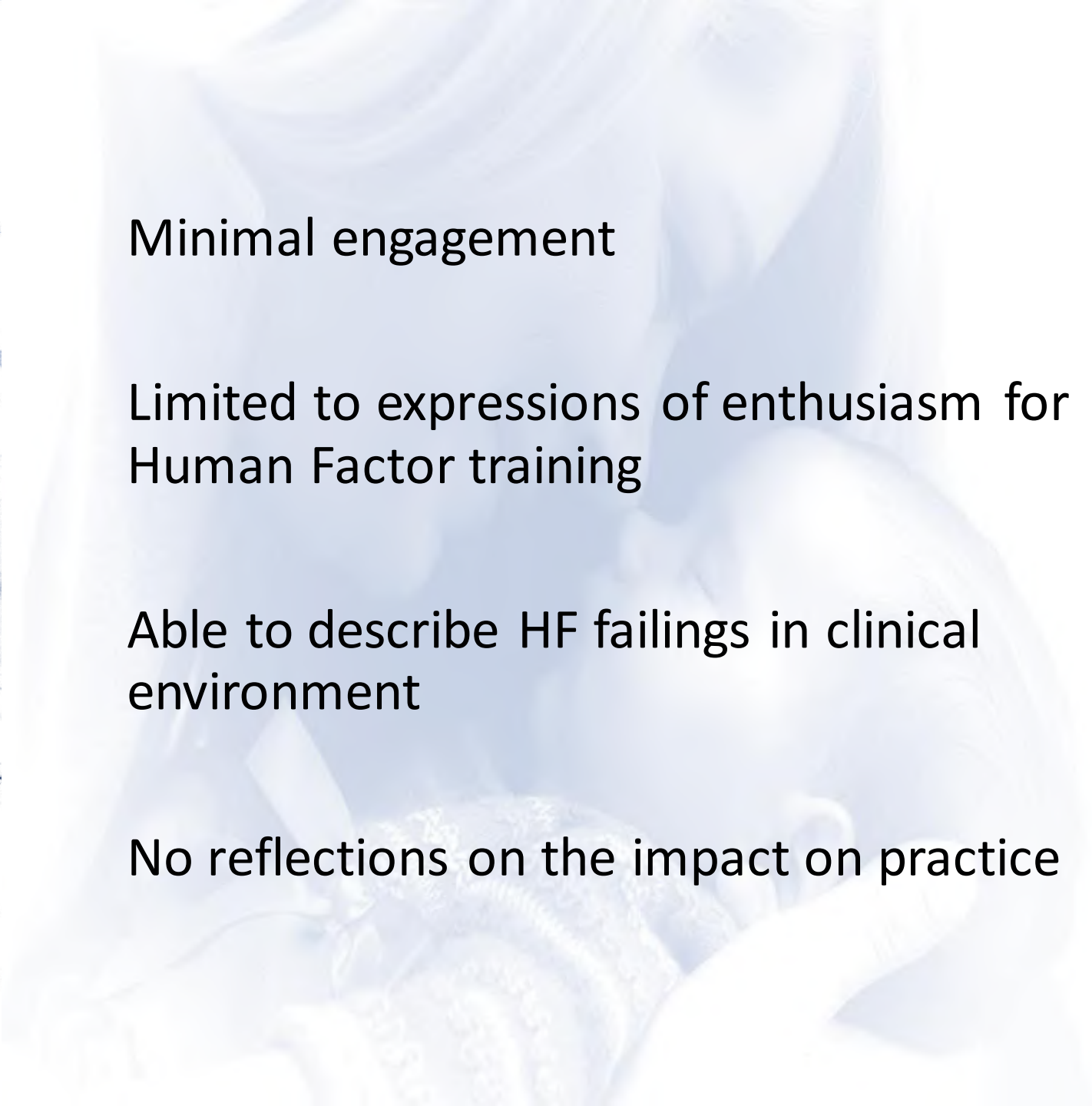
*“Culture change is very difficult in the NHS especially within maternity settings.”*

*“Implementing change and changing people’s thought processes ... encouraging personal reflection and self-awareness will be difficult.”*

- Time & staffing



## Results – Reflective accounts



Minimal engagement

Limited to expressions of enthusiasm for Human Factor training

Able to describe HF failings in clinical environment

No reflections on the impact on practice

# Results – semi-structured interviews

## **Specific changes in Non Technical Skills required:**

Improved patterns of communication

Enhancing teamwork

Moving from 'noisy & messy' to systematic and psychologically safe

Improved leadership

More flexible and fluid

'Permission' to hand over responsibility for both actions & overview



# Results – semi-structured interviews

## **General overall viewpoint:**

Endorsement of high level of satisfaction with course

Agreement to roll out training to more junior staff

Challenge of changing culture

# Key messages

Successful educational intervention

Enthusiasm for roll out of programme to ALL staff

Identification of non technical skill improvements

Cultural challenge: development of strategies to enable good practice to be firmly embedded in day to day management in maternity care

