Understanding Human Factors in Healthcare

Hong Kong June 2011

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Search

Home | Patients | Visitors | Our services | GPs | Research | Media | Working with us | About us

- About us
- Research news
- Why take part in research?
- What does taking part in research involve?
- Clinical trials
- Our research centres
  - Centre for Patient Safety and Service Quality
    - About us
    - Meet the team
    - Research topics
    - Recent publications
    - Our research partners
    - Information for researchers
    - Contact us
    - Getting here
  - Hepatology research unit
  - HIV research unit
  - International Centre for Circulatory Health
  - Neonatal research unit
  - Paediatric research unit
  - Rheumatology research unit
  - Sir John McMichael centre
- Information for researchers

Centre for Patient Safety and Service Quality

Research at the Imperial Centre for Patient Safety and Service Quality (CPSSQ) is focused on improving the **safety of patients** and the **quality of services** within the NHS.

The CPSSQ has facilities at St Mary's Hospital, Hammersmith Hospital and Imperial College London. It is a **partnership** between Imperial College Healthcare NHS Trust and Imperial College London. You can read more in our about us section.

We play a key role in establishing studies of safety and quality as a fundamental part of medical research in the UK. Our research has a strong focus on **psychology** and covers a variety of topics, including:

- Decision-making in healthcare workers
- Patient behaviour
- The design of medical technology
- Education and training
- Organisation and management

You can read more in our research topics section.

For more information about the CPSSQ, use the links on the left. You can also visit the main CPSSQ website, which is aimed at researchers and healthcare professionals as well as the general public.

Accessibility | Disclaimer | Site map

NHS 60 Imperial College London

News

Clinician manager programme shortlisted to success

Cymbeline Moore

A PROJECT which recruits and trains doctors in core management skills has been shortlisted for the prestigious Health Service Journal (HSJ) awards.

The new Value of Services (ToS) project has been shortlisted in the Data Driven Service Improvement category.

ToS works by fostering a culture of data-driven service development and close working relationships between clinicians and managers by training doctors in medical management skills. The roles are also secured to undertake quantitative assignments using an amalgamation of medical and operational research methodologies which the project designed.

Reducing this misallocation could increase trust revenue by £60 per patient episode and the resulting increase in data accuracy could be a help to drive service development.

The programme was developed by Reza Nourai, specialist registrar in academic ENT surgery with the support of Louise Tomkins, former directorate manager.

Mr Nourai said: "We are delighted to have been shortlisted for this prestigious award. It is a testament to the success of the project and to the hard work of everyone involved."

The HSJ awards take place on December 1 in Park Lane, London. The trust will compete with four other organisations in this category.

Project lead Reza Nourai

Business cases for head and neck cancer, urology, vascular and laparoscopic surgery were produced as part of the programme to investigate and address the impact gaps in resource availability have on clinical outcomes.

Clinical coding errors also fell from 15 to less than 1.5 percent as a result of the project.

> **"We are delighted to have been shortlisted for this prestigious award. It is a testament to the success of the project and to the hard work of everyone involved**

Patient Safety Centre celebrates first birthday

Sandra Iskander

THE IMPERIAL Centre for Patient Safety and Service Quality (CPSSQ) is celebrating its first twelve months as a centre for research into providing safer healthcare.

One of only two such centres in the UK, the CPSSQ brings together a range of disciplines to carry out translational research into how to achieve safer and better quality healthcare.

Highlights from the first year of research include an evaluation of an automated, ward-based dispensing system to improve the management of controlled drugs and the development and piloting of a surgical checklist designed to ensure that routine safety practices are reliably collected.

Other streams of work are looking at how to reduce hospital associated infections and how NHS organisations can better use information to improve quality.

Professor Bryony Dean Franklin, executive lead pharmacist for research at the Trust, is acting director of the CPSSQ while Professor Charles Vincent is on sabbatical.

She said: "We are really proud of the work that the centre has achieved so far. Now that we are well established, we are looking forward to developing some more long-term research projects, many of which will be based in the Trust.

"In the coming months, we also hope to offer support to front-line staff who are working hard to improve safety and quality in their areas."

Professor Bryony Dean Franklin, acting director of the CPSSQ

Research opportunities

If you or your team are working on research projects to improve patient safety, the centre would like to hear from you. The centre has a highly experienced team of researchers and clinicians who can offer advice on designing studies, collecting and analysing data and any other factors needed to create research projects which are academically robust. They can also put you in touch with other like-minded clinicians and managers who can offer a network of information and support. If you would like any help, please contact the centre manager, Sandra Iskander on s.iskander@imperial.ac.uk.

In your patch

Outpatients at St Mary's

A PHARMACY HUB which will make discharging medication much faster is just one of the innovations at the newly refurbished St Mary's outpatients facility.

Both the exterior and ground floor of the unit, which is the main waiting area for patients, have been given a facelift to improve patient flow and efficiency.

The unit now has a new café and a pedestrianised area providing a new access entrance.

10S

A STATE-OF-THE-ART head and neck unit, which will provide an entirely new service to patients, is planned for 10S at Charing Cross hospital.

The project, which costs £2.4m, will provide 28 beds overall with six single en-suite rooms and a range of equipment such as ceiling mounted hoists.

The unit is due for completion in June 2009.

Lindo wing

THE GROUND FLOOR of the Lindo Wing at St Mary's has been completely refurbished.

Patients and staff can look forward to a new waiting room, administration area and refurbished consultation rooms.

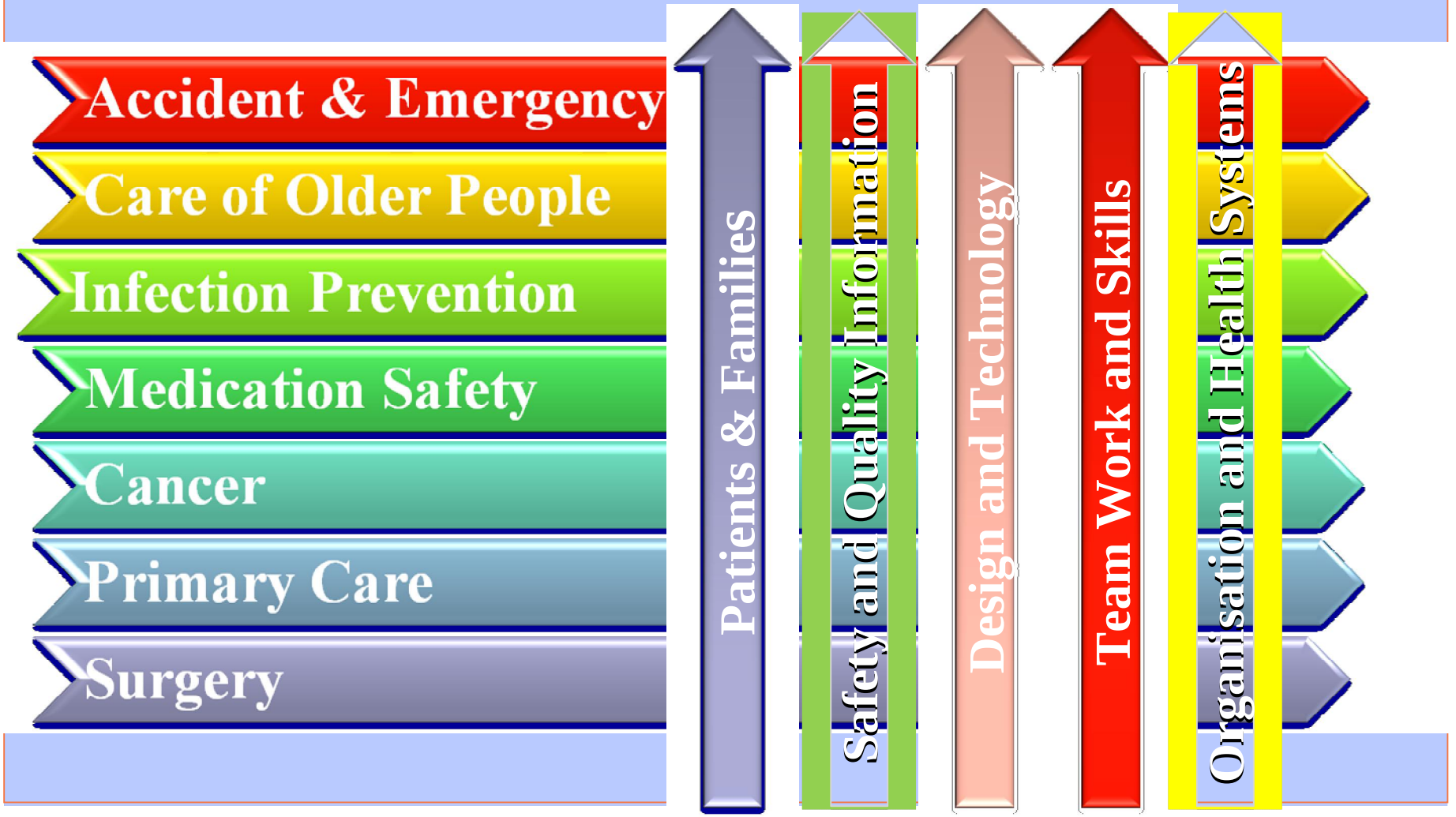
Disabled access has also been improved and a new trio of operations rooms due to open soo.

New 3T MRI

A NEW 3T MRI machine is coming on line at Charing Cross to join the other two MRI units already housed in the imaging department on the first floor.

Work has started to modify the structure, also in the pharmacy directly below where the unit will sit. The new unit will be fully installed by the end of this financial year.

Cross cutting themes



Overview

- How has healthcare interpreted human factors?
- Death from intrathecal injection
- Methods of analysis
- From accident analysis to system design
- Design for safety
- Training for human factors

What are Human Factors?

Professor Peter Buckle, President Elect of the Institute of Ergonomics and Human Factors (UK):

"Ergonomics (or human factors) is the scientific discipline concerned with the understanding of interactions among humans and other elements of a system, and the profession that applies theory, principles, data and methods to design in order to optimize human well-being and overall system performance."

What are *Clinical* Human Factors?

Dr Ken Catchpole, a human factors expert who has done much work in healthcare has provided this brief definition: *"Enhancing clinical performance through an understanding of the effects of teamwork, tasks, equipment, workspace, culture, organisation on human behaviour and abilities, and application of that knowledge in clinical settings."*

Understanding why things go wrong

The safety paradox

- Healthcare staff are:
  - Highly trained & motivated
  - Committed to their patients
  - Use sophisticated technology
- Errors are common and patients are frequently harmed

Intrathecal Injection of Vincristine

- 17.00 Jan 4th David James prepared for IT administration of Cytosine
- Lumbar puncture carried out and Cytosine administered by SHO
- SHO passed second drug, Vincristine, by SpR
- After querying, SHO administered drug
- Mr James died 8.10 am 2nd February

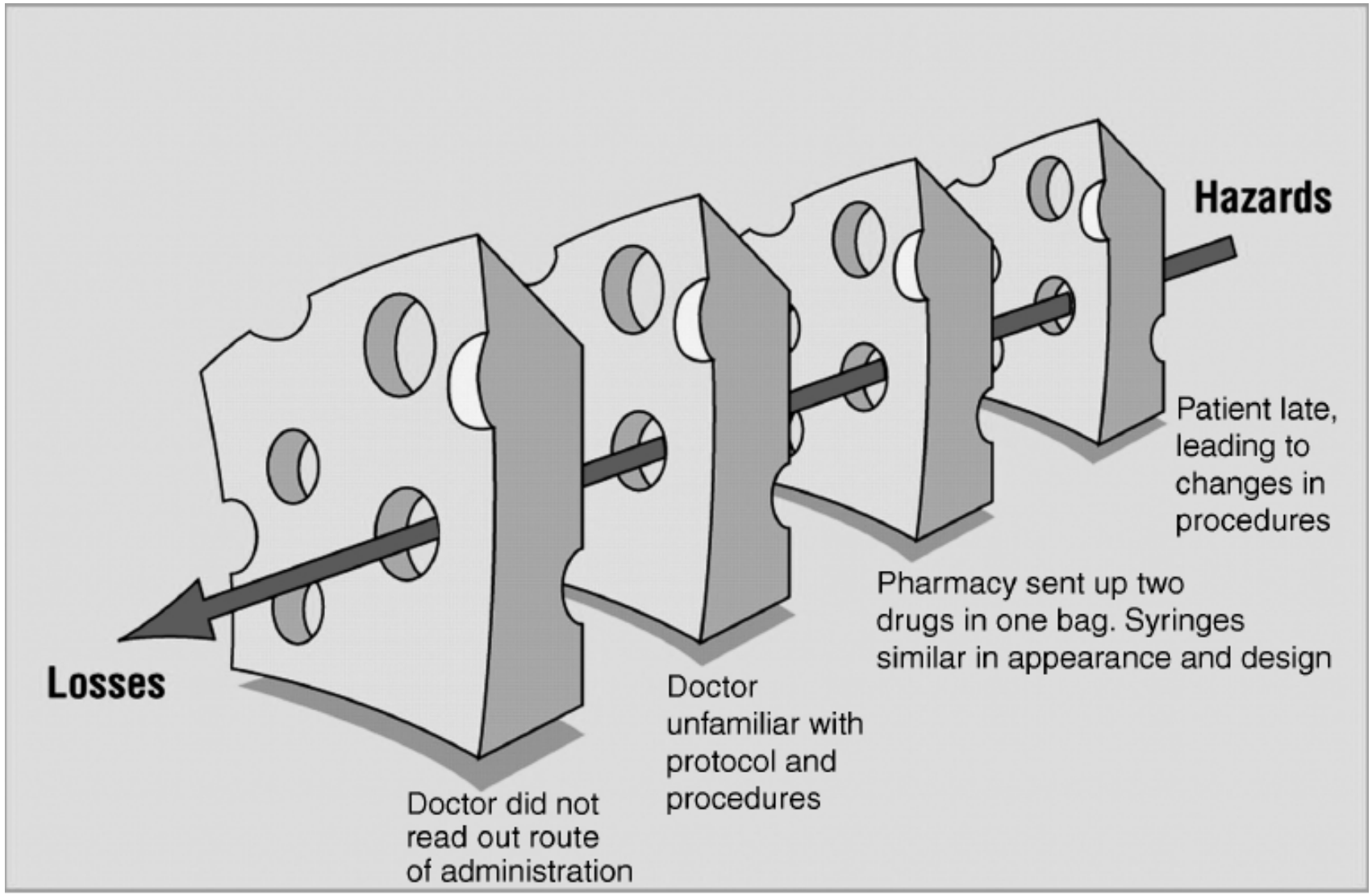


Figure 8.1 Swiss cheese diagram. (Figure adapted from Reason, 1997)

A reconstruction of how the two syringes would have looked in their respective packaging – Plate 4

A photograph of two similar syringes to those used in the procedure – Plate 2

Assumptions

- Dr Mitchell assumed:
  - Two types of chemotherapy never on ward at same time
  - Dr North competent to administer chemotherapy
  - Dr North familiar with Mr James' case
- Dr North assumed:
  - Assumed Dr Mitchell authorised to supervise him
  - Assumed OK to give chemotherapy if supervised
- Senior doctors assumed 'induction period' understood

Understanding why things go wrong

- Chain of events
- Complexity and contributory factors
- The importance of cumulative errors and flaws in processes
- Tackling safety on many levels

Rather than being the instigators of an accident, operators tend to be the inheritors of system defects … their part is usually that of adding the final garnish to a lethal brew whose ingredients have been long in the cooking’ (Reason, 1990)

Methods of Analysis

Person versus System explanations

- Person Centred View
  - Focuses on those at the `sharp end'
  - Individual responsibility and blame
  - Countermeasures aimed at changing individuals' behaviour
- System View
  - Human beings fallible, errors to be expected
  - Focus on factors influencing errors
  - Countermeasures aimed at conditions of work

How to investigate and analyse clinical incidents: Clinical Risk Unit and Association of Litigation and Risk Management protocol

Charles Vincent, Sally Taylor-Adams, E Jane Chapman, David Hewett, Sue Prior, Pam Strange, Ann Tizzard

Why do things go wrong? Human error is routinely blamed for disasters in the air, on the railways, in complex surgery, and in health care generally. However, quick judgments and routine assignment of blame obscure a more complex truth. The identification of an obvious departure from good practice is usually only the first step of an investigation. Although a particular action or omission may be the immediate cause of an incident, closer analysis usually reveals a series of events and departures from safe practice, each influenced by the working environment and the wider organisational context. This more complex picture is gaining acceptance in health care,[1,2] but it is seldom put into practice in the investigation of actual incidents.

The Clinical Risk Unit has developed a process of investigation and analysis of adverse events for use by researchers.[3–7] Two years ago a collaborative research group was formed between the unit and members of the Association of Litigation and Risk Management (ALARM). This group has adapted the research methods to produce a protocol for the investigation and

Summary points

- Analyses of clinical incidents should focus less on individuals and more on organisational factors
- Use of a formal protocol ensures a systematic, comprehensive, and efficient investigation
- The protocol reduces the chance of simplistic explanations and routine assignment of blame
- Experience with the protocol suggests that training is needed for it to be used effectively
- Analysis of incidents is a powerful method of learning about healthcare organisations
- Organisational analysis lead directly to strategies for enhancing patient safety

Clinical Risk Unit, Department of Psychology, University College London, London WC1E 6BT
Charles Vincent
reader in psychology

continued over

BMJ 2000;320:777–81

website extra
Further details of the investigation process are available on the BMJ's website
www.bmj.com

The NEW ENGLAND JOURNAL of MEDICINE

HEALTH POLICY REPORT

PATIENT SAFETY

Understanding and Responding to Adverse Events

Charles Vincent, Ph.D.

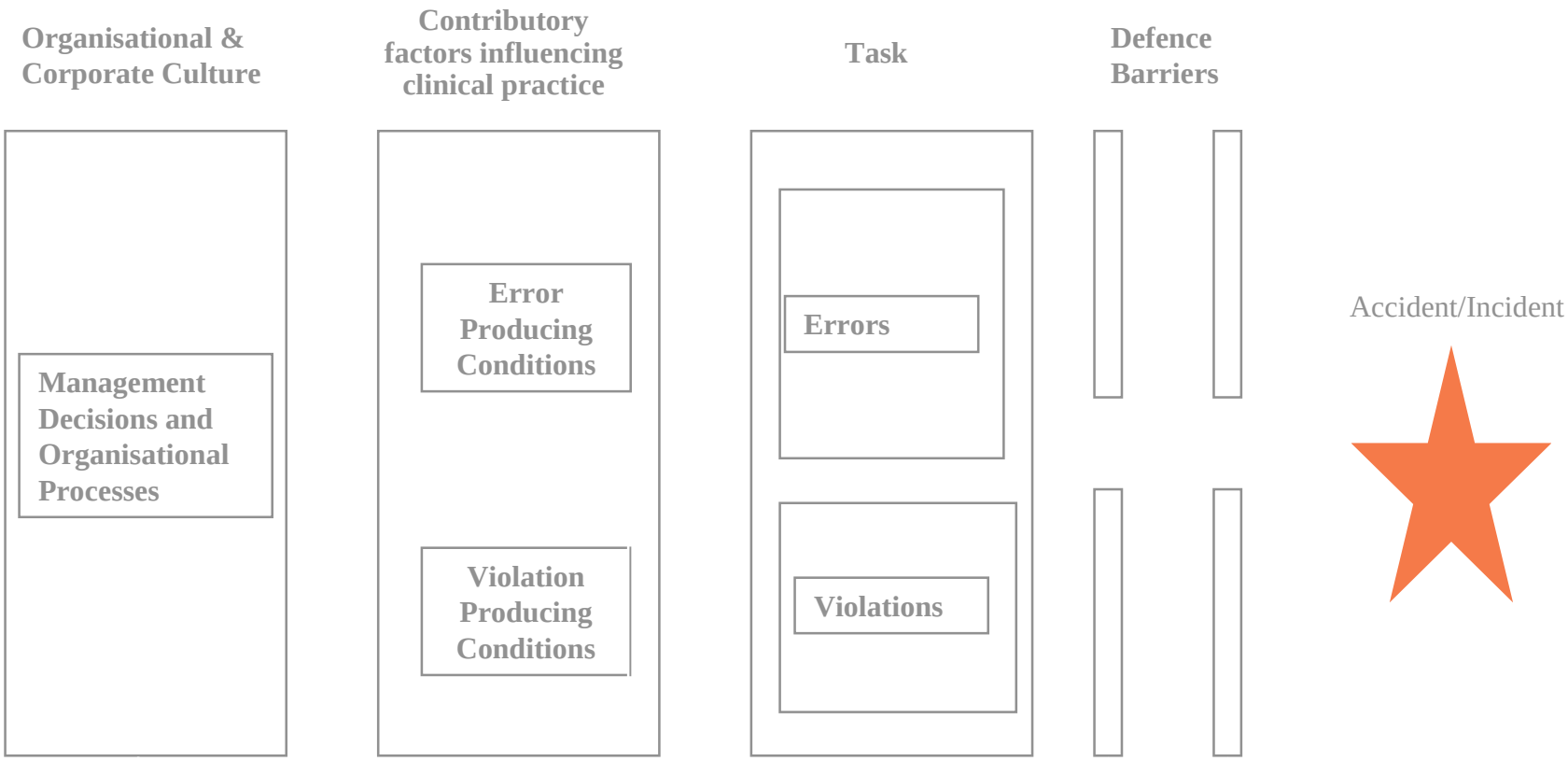
The London Protocol

www.cpssq.org

Protocol for the Investigation and Analysis of Clinical Incidents

- To utilise clinical expertise to fullest extent
- Ensure comprehensive approach
- Less threatening to staff
- Prevent immediate assignment of blame

Stages of development of an organisational accident



Adapted from Reason (1990)

Contributory factors: 7 levels of safety

- Patient
- Task
- Individual staff
- Team
- Working conditions
- Organisational
- Government and regulatory

Vincent, Adams, Stanhope 1998

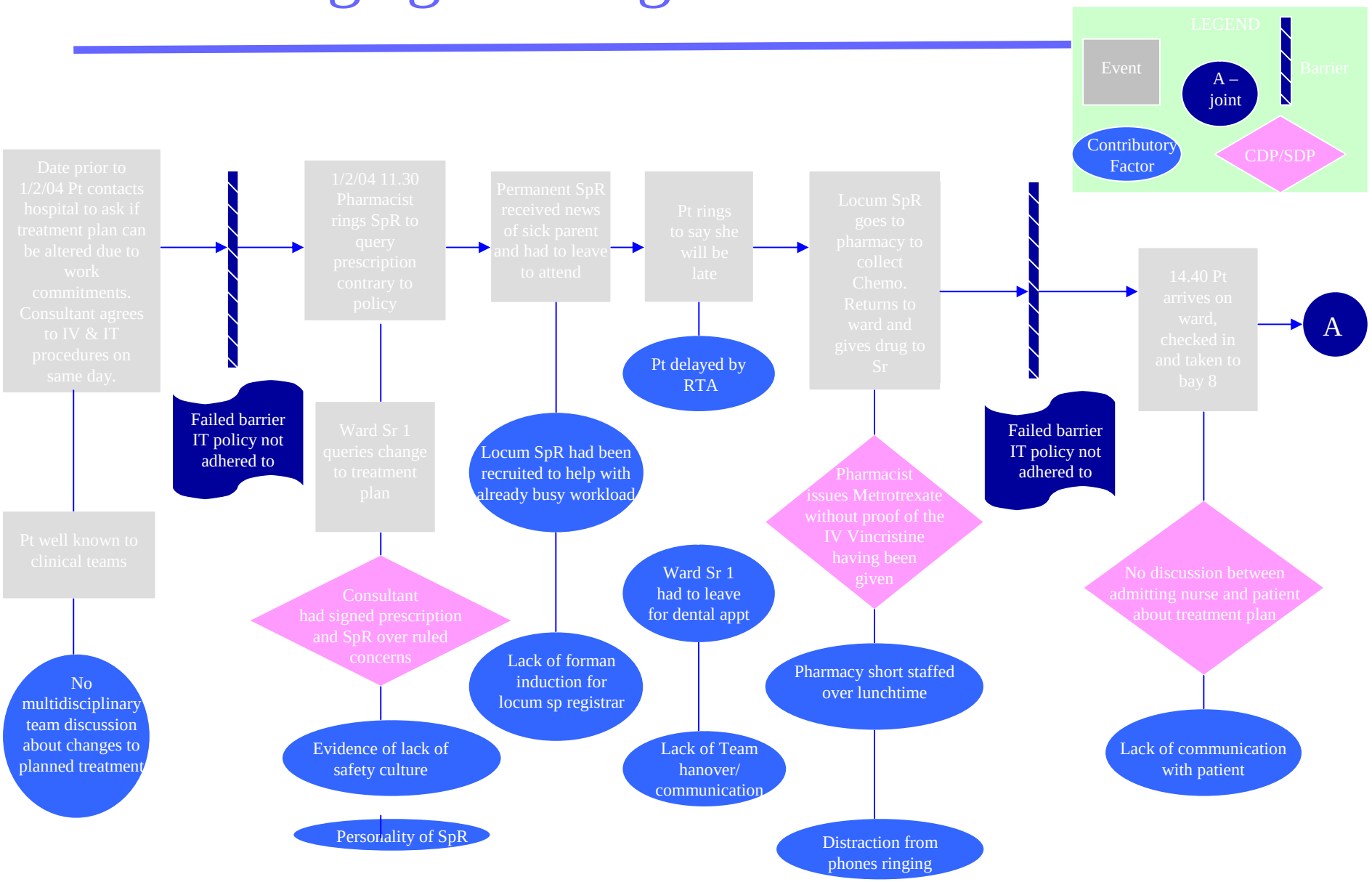
The Process of Investigation: the ‘moves’

The core of the process is to ask:

- What happened?
- How did it happen?
- Why did it happen?

- Get the story (the real story not the one in the notes)
- Identify the care delivery problems
- Consider the contributory factors
  - And what does this tell you about your system?
- Prioritisation and action

How things go wrong



Systems analysis or root cause analysis?

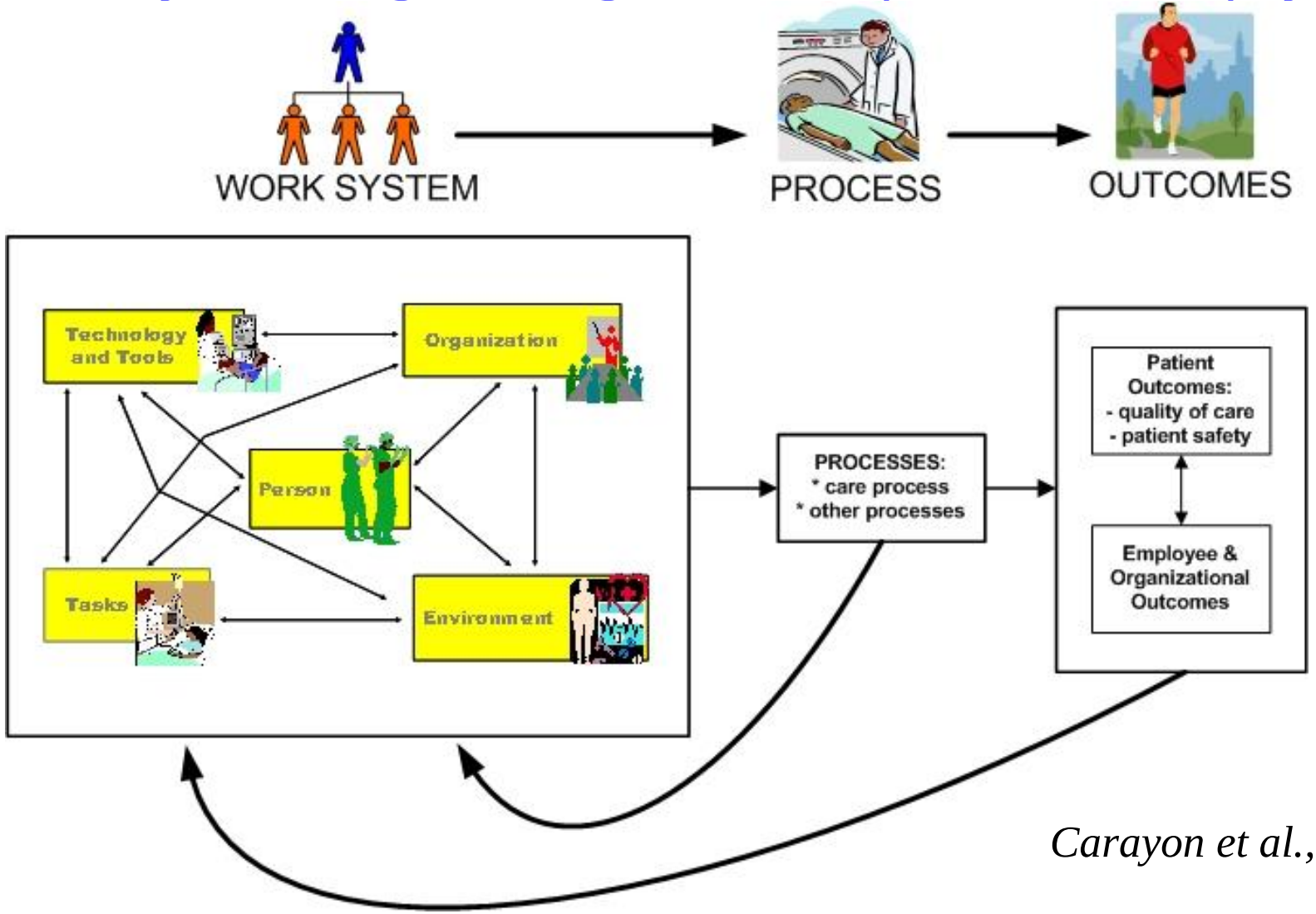
- Implies single root cause (or small number)
  - But causes much more fluid
  - Chain of events and contributory factors
- Purpose of analysis
  - To find out what happened?
  - Properly understood the analysis looks forward

A Window on the System

- Case analysis brings understanding of systems
  - Complexity of events and contributory factors
  - Moving away from blame
- Case analysis to identify common themes and systemic weaknesses
  - Looking to the future
  - Prioritising contributory factors
  - Generating plans for action

SEIPS Model of Work System and Patient Safety

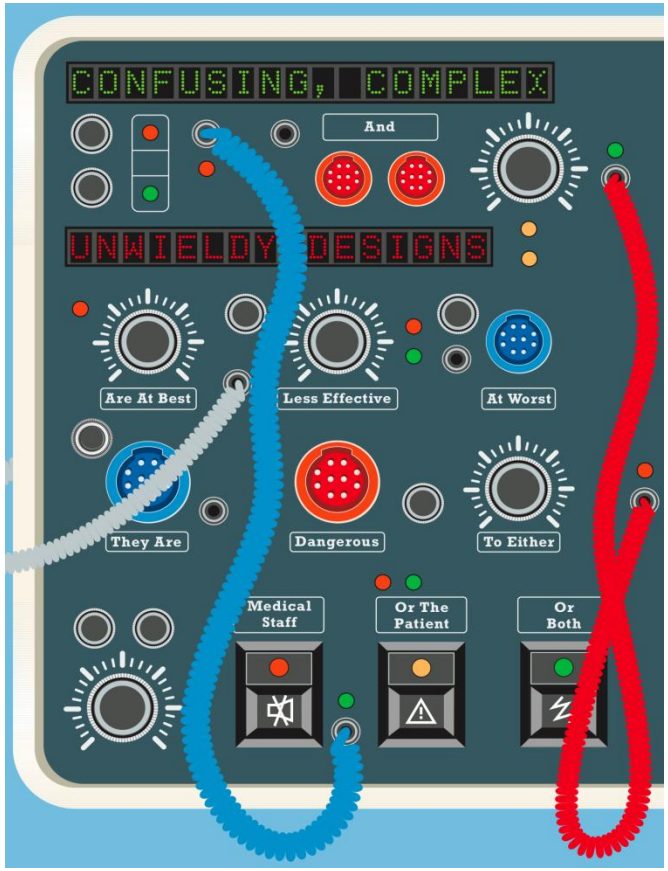
SEIPS = System Engineering Initiative for Patient Safety



Carayon et al., 2006

Building safety into the system


KEEP OUT OF CHILDREN'S REACH
HUMAN BEINGS make MISTAKES
because the SYSTEMS,
TASKS and PROCESSES they work
in are poorly designed.
PROF. LUCIAN LEAPE,
Harvard School of Public Health


CONFUSING, COMPLEX
And
UNWIELDY DESIGNS
Are At Best
Less Effective
At Worst
They Are
Dangerous
To Either
Medical Staff
Or The Patient
Or Both

Recommendation

Use blank space to emphasise critical information

Use blank space to emphasise critical information such as the medicine name and strength.

Failure designed-out

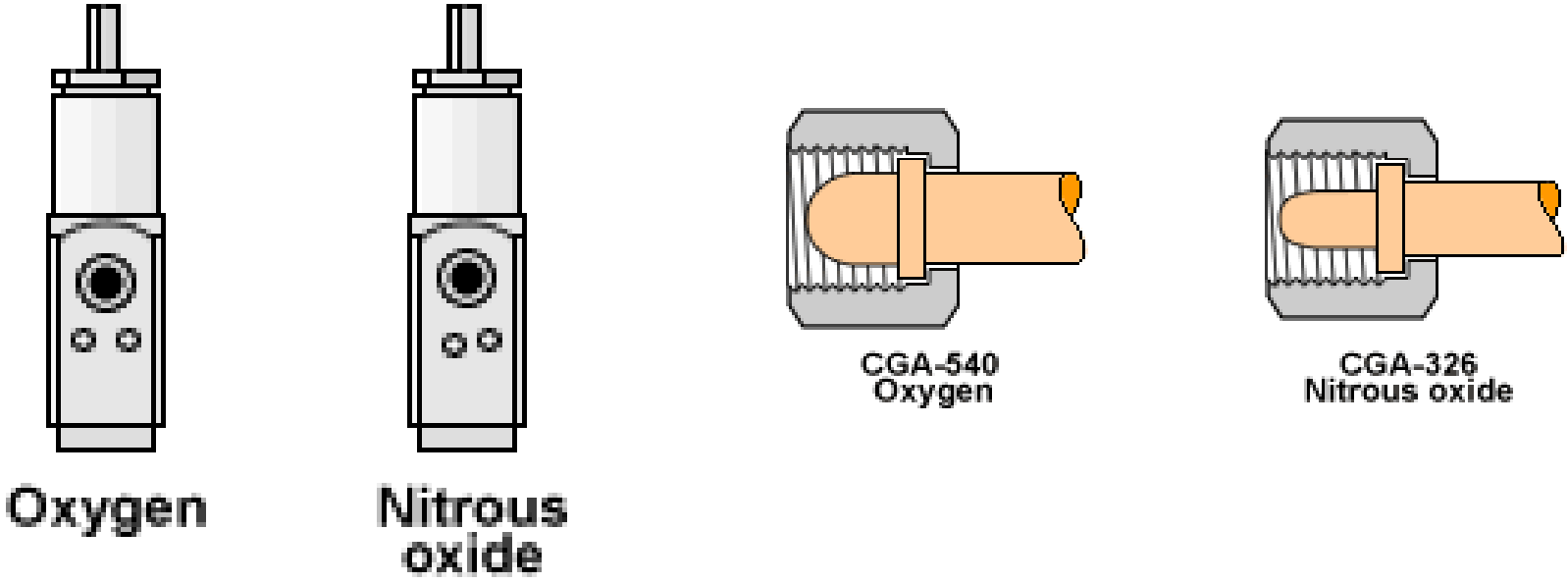


Figure 1 The problematic Luer equipment. Compatibility between devices used to administer drugs via different routes makes misconnection errors possible.

Issue 02 February 2011

News on the implementation of devices with safer connectors

Neuraxial Update

Design for patient safety

There have been fatal cases where intravenous medicines have been administered by the spinal (intrathecal) route and epidural medicines have been administered by the intravenous route.

There is also the potential for medicines intended for regional anaesthesia to be administered by the intravenous route, with fatal outcomes.

These wrong route errors will always be possible as long as medical devices with standard (Luer) connectors are used.

The introduction and use of medical devices which do not physically connect with intravenous equipment will further reduce the risk of wrong route errors.

NHS National Patient Safety Agency

In this issue

NHS Supply Chain

Supplier demonstration days

In support of the NPSA Patient Safety Alert on safer spinal (intrathecal) epidural and regional devices, and in conjunction with the NPSA and contracted NHS suppliers of relevant devices, NHS Supply Chain are in the early stages of arranging intrathecal demonstration days for the NHS.

Please contact NHS Supply Chain to register your interest at sharps@supplychain.nhs.uk

New timelines for implementation

A Patient Safety Alert Update was issued on 31 January 2011 by the NPSA. The Alert Update announced a change of implementation completion date for Part A guidance from 1 April 2011 to 1 April 2012.

The implementation completion date is being changed to provide healthcare organisations with additional time to review and evaluate the range of new devices and test information available, introduce these new devices into practice, and take action required to minimise any potential practice risks arising from the use of these new devices by healthcare practitioners.

By 1 April 2012 the following actions will have been **completed**:

- **all spinal (intrathecal) bolus doses and lumbar puncture samples are performed using syringes, needles and other devices with safer connectors that will not connect with intravenous Luer connectors.**

Safer devices should be introduced into practice as soon as possible and without undue delay during 2011 in order to comply with the implementation deadline of 1 April 2012.

Part B guidance concerning epidural therapy, spinal infusions and regional anaesthesia and support information remains unchanged. No further changes to implementation target dates for Part A and Part B guidance are anticipated.

New information about devices

Flexicare have launched a range of Hall Lock spinal needles and syringes. The following products are available:

- pencil point spinal needles 22g – 27g;
- spinal syringes 1ml,3ml, 5ml and 10ml.

Becton Dickinson are planning to supply the following devices:

April 2011

- a wide range of spinal needles with Whitacre or Quincke tip types, with various gauge sizes from 18 to 27G, and lengths of 38 to 127mm;
- Non-luer introducer needles for Whitacre 25G and Whitacre 27G
- Syringes and blunt filter needles.

June/July 2011

- syringe caps for chemotherapy;
- compatible lumbar puncture devices (manometer, 3-way-tap) and kits.

B Braun Medical have announced:

- a full range of SafeConnect Spinal needles which are compatible with the Surety accessory portfolio including syringes, caps and filling devices;
- the spinal needle portfolio will include a wide range of sizes: 18G to 27G, 40mm to 120mm;
- custom procedure packs will also be provided with B Braun spinal needles and Surety syringes and accessories.

CME McKinley are planning to supply the following devices:

First half 2011

- BodyGuard epidural infusion sets featuring the InterVenSurety connector enabling the widely used CME BodyGuard 545 Epidural infusion system to be compatible with all downstream devices fitted with Surety connectors.

Anaesthesia
Journal of the Association of Anaesthetists of Great Britain and Ireland

Anaesthesia, 2010, **65**, pages 1069–1079 doi:10.1111/j.1365-2044.2010.06537.x

ORIGINAL ARTICLE

A simulation-based evaluation of two proposed alternatives to Luer devices for use in neuraxial anaesthesia*

T. M. Cook,[1] S. Payne,[2] E. Skryabina,[3] D. Hurford,[2] E. Clow[2] and A. Georgiou[2]

1 Consultant, 2 Specialist Registrar, Department of Anaesthesia, Royal United Hospital, Bath, UK
3 Scientist, Bath Institute of Medical Engineering, Wolfson Centre, Royal United Hospital, Bath, UK

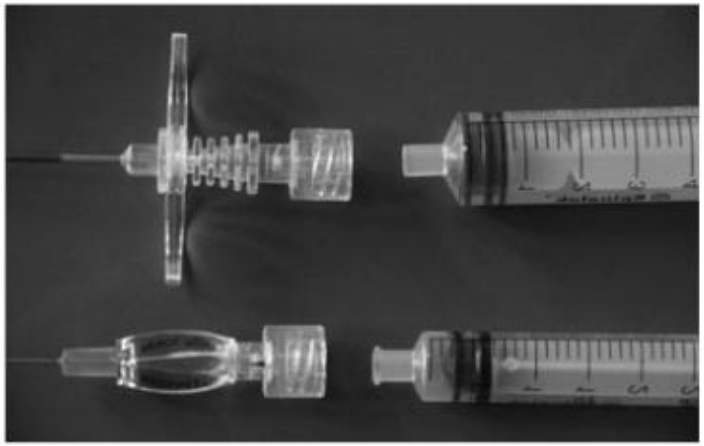


Figure 2 The Spinalok® connector in close up view. Top: 'slip connector'; bottom: locking connector.

There are two aspects to our results. First, we have assessed the usability (clinician acceptability) of two new non-Luer systems of neuraxial equipment. In direct comparison with the standard systems, the new devices were rated less good overall, but in absolute terms, the new devices generally scored as 'acceptable'. Second, we have assessed the potential for cross-connectivity and found to our surprise that both new systems can be made to cross-connect with Luer connectors.

Human factors training
Safety awareness and safety skills

Qualities and attributes of a safe practitioner: identification of safety skills in healthcare

S Long, S Arora, K Moorthy, N Sevdalis, C Vincent

► Additional data is published online only. To view these files please visit the journal online (http://qualitysafety.bmj.com).

Centre for Patient Safety and Service Quality, Imperial College London, UK

Correspondence to
Dr Susannah Jane Long, Clinical Research Fellow, Geriatric and General Medicine, Centre for Patient Safety and Service Quality, Room 504, Medical School Building, Imperial College (St. Mary's Campus), Norfolk Place, London W2 1PG, UK; s.long@imperial.ac.uk

Accepted 30 July 2010

Objectives: (1) To identify a range of safety skills (attributes of a safe practitioner) relevant across clinical specialities. 2) To obtain the views of clinicians regarding their importance and trainability.

Design: We used a survey and focus group of 10 patient safety experts to extract a list of safety skills. 50 experienced clinicians rated the skills in terms of importance and trainability in an electronic questionnaire.

Setting: A Clinical Safety Research Unit and its associated NHS Trust, within an Academic Health Science Centre.

Results: 73 skills, in 18 broad categories, were identified from the focus group and survey. The majority of clinicians felt the skills were important (most important: technical skills (98%), crisis management (98%), honesty (97.5%); least important: open-mindedness (82%), patient awareness/empathy (81.7%), humility (81.2%)). There was less agreement about trainability (16/18 categories were felt to be trainable; most trainable: technical skills (98%), anticipation/preparedness (84%), organisational skills/efficiency (83%); least trainable: conscientiousness (56%), humility (40%), open-mindedness (30%)).

unintended consequences: efforts to improve patient safety have paid insufficient attention to the role of clinicians on the front line, in terms of maintaining safety within imperfect healthcare systems.[1] Although the actions of the government and senior management have an important role to play, the people who work in an organisation are also part of that system; each brings their own contribution to safe, high quality care.[2] At the coalface, safety may be either eroded by the actions and omissions of individuals or, conversely, created by skilful, safety conscious professionals. People maintain safety by being conscientious, disciplined and following rules, for example, by washing their hands or adhering to prescribing guidelines. However, keeping patients safe, particularly those with complex and fluctuating conditions, also requires anticipation, awareness of hazards, preparedness, resilience and flexibility, the qualities that those studying

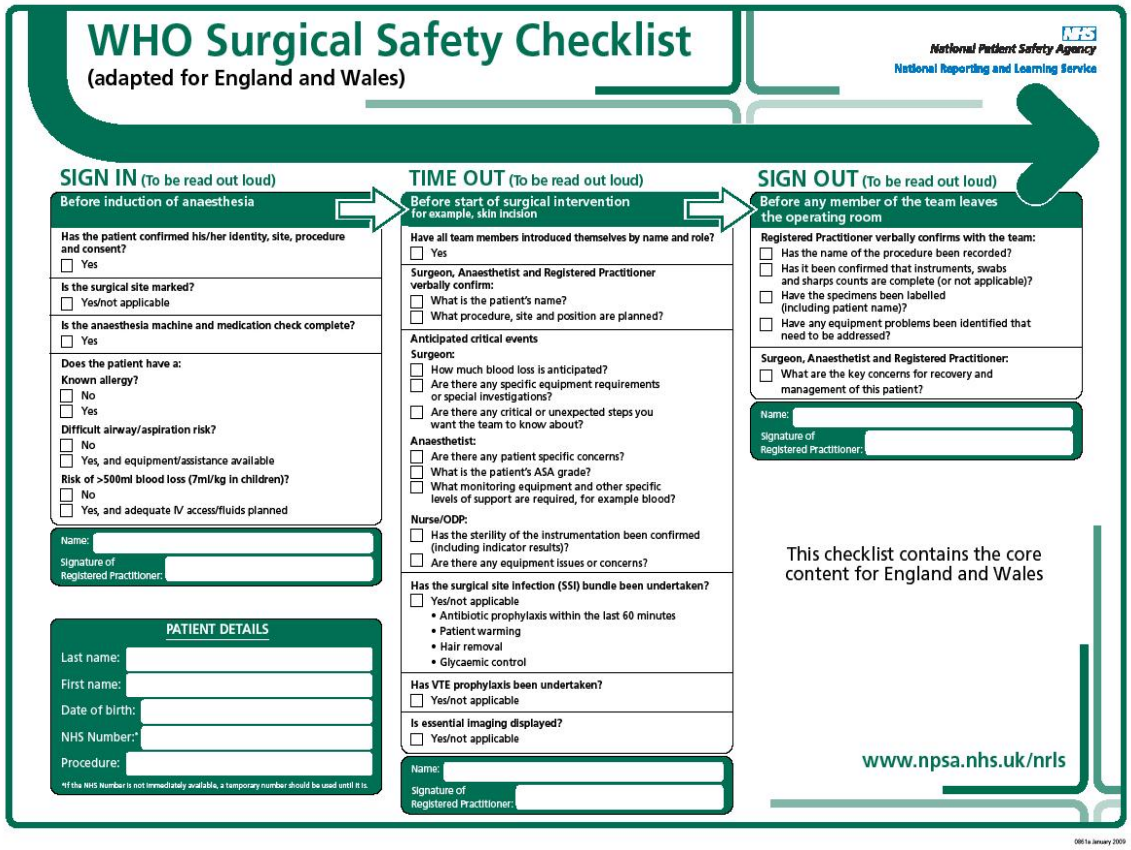
Speaking up

The NEW ENGLAND JOURNAL of MEDICINE

SPECIAL ARTICLE

A Surgical Safety Checklist to Reduce Morbidity and Mortality in a Global Population

Alex B. Haynes, M.D., M.P.H., Thomas G. Weiser, M.D., M.P.H., William R. Berry, M.D., M.P.H., Stuart R. Lipsitz, Sc.D., Abdel-Hadi S. Breizat, M.D., Ph.D., E. Patchen Dellinger, M.D., Teodoro Herbosa, M.D., Sudhir Joseph, M.S., Pascience L. Kibatala, M.D., Marie Carmela M. Lapitan, M.D., Alan F. Merry, M.B., Ch.B., F.A.N.Z.C.A., F.R.C.A., Krishna Moorthy, M.D., F.R.C.S., Richard K. Reznick, M.D., M.Ed., Bryce Taylor, M.D., and Atul A. Gawande, M.D., M.P.H., for the Safe Surgery Saves Lives Study Group*



WHO Surgical Safety Checklist

(adapted for England and Wales)

National Patient Safety Agency
National Reporting and Learning Service

SIGN IN (To be read out loud)

Before induction of anaesthesia

Has the patient confirmed his/her identity, site, procedure and consent?
- ☐ Yes

Is the surgical site marked?
- ☐ Yes/not applicable

Is the anaesthesia machine and medication check complete?
- ☐ Yes

Does the patient have a:

Known allergy?
- ☐ No
- ☐ Yes

Difficult airway/aspiration risk?
- ☐ No
- ☐ Yes, and equipment/assistance available

Risk of >500ml blood loss (7ml/kg in children)?
- ☐ No
- ☐ Yes, and adequate IV access/fluids planned

Name:

Signature of Registered Practitioner:

TIME OUT (To be read out loud)

Before start of surgical intervention
for example, skin incision

Have all team members introduced themselves by name and role?
- ☐ Yes

Surgeon, Anaesthetist and Registered Practitioner verbally confirm:
- ☐ What is the patient's name?
- ☐ What procedure, site and position are planned?

Anticipated critical events

Surgeon:
- ☐ How much blood loss is anticipated?
- ☐ Are there any specific equipment requirements or special investigations?
- ☐ Are there any critical or unexpected steps you want the team to know about?

Anaesthetist:
- ☐ Are there any patient specific concerns?
- ☐ What is the patient's ASA grade?
- ☐ What monitoring equipment and other specific levels of support are required, for example blood?

Nurse/ODP:
- ☐ Has the sterility of the instrumentation been confirmed (including indicator results)?
- ☐ Are there any equipment issues or concerns?

Has the surgical site infection (SSI) bundle been undertaken?
- ☐ Yes/not applicable
  - Antibiotic prophylaxis within the last 60 minutes
  - Patient warming
  - Hair removal
  - Glycaemic control

Has VTE prophylaxis been undertaken?
- ☐ Yes/not applicable

Is essential imaging displayed?
- ☐ Yes/not applicable

Name:

Signature of Registered Practitioner:

SIGN OUT (To be read out loud)

Before any member of the team leaves the operating room

Registered Practitioner verbally confirms with the team:
- ☐ Has the name of the procedure been recorded?
- ☐ Has it been confirmed that instruments, swabs and sharps counts are complete (or not applicable)?
- ☐ Have the specimens been labelled (including patient name)?
- ☐ Have any equipment problems been identified that need to be addressed?

Surgeon, Anaesthetist and Registered Practitioner:
- ☐ What are the key concerns for recovery and management of this patient?

Name:

Signature of Registered Practitioner:

PATIENT DETAILS

Last name:

First name:

Date of birth:

NHS Number:*

Procedure:

*If the NHS Number is not immediately available, a temporary number should be used until it is.

This checklist contains the core content for England and Wales

www.npsa.nhs.uk/nrls

0861a January 2009

Key team skills

Communication Quality and quantity of information exchanged among team member

Leadership Provision of directions, assertiveness, and support among members of the team

Mutual Support/Cooperation Assistance provided among members of the team, supporting others, and correcting errors

Situational Awareness Team observation and awareness of ongoing processes

Coordination Management and timing of activities and tasks

Observational Teamwork Assessment for Surgery

Construct Validation With Expert Versus Novice Raters

Nick Sevdalis, BSc, MSc, PhD,† Melinda Lyons, BSc, PhD,* Andrew N. Healey, PhD,* Shabnam Undre, PhD, FRCSE,* Ara Darzi, KBE, MD, FRCS,* and Charles A. Vincent, BSc, PhD**

Objective: To test the construct validity of the Observational Teamwork Assessment for Surgery (OTAS) tool.

Summary Background Data: Poor teamwork in surgical teams has been implicated in adverse events to patients. The OTAS is a tool that assesses teamwork in real time for the entire surgical team. Existing empirical research on OTAS has yet to explore how expert versus novice tool users use the tool to assess teamwork in the operating room.

Methods: Data were collected in 12 elective procedures by an expert/expert (N = 6) and an expert/novice (N = 6) pair of raters. Five teamwork behaviors (communication, coordination, leadership, monitoring, and cooperation) were scored via observation pre, intra, and postoperatively by blind raters.

Results: Significant and sizeable correlations were obtained in 12 of 15 behaviors in the expert/expert pair, but only in 3 of 15 behaviors in the expert/novice pair. Significant differences in mean scores were obtained in 3 of 15 behaviors in the expert/expert pair, but in 11 of 15 behaviors in the expert/novice pair. Total OTAS scores exhibited strong correlations and no significant differences in ratings in the expert/expert pair. In the expert/novice pair no correlations were obtained and there were significant differences in mean scores. The overall size of inconsistency in the scoring was 2% for expert/expert versus 15% for expert/novice.

Conclusions: OTAS exhibits adequate construct validity as assessed by consistency in the scoring by expert versus novices—ie, expert raters produce significantly more consistent scoring than novice raters. Further validation should assess the learning curve for [illegible] ships between OTAS, measures of technical sk[illegible] to surgical crises should also be quantified.

(*Ann Surg* 2009;249: 1047–1051)

by poor communication, coordination, and other aspects of teamwork in operating room (OR) teams.[7–9] Following these studies, teamwork has been conceptualized as 1 of 3 key components of surgical performance by what has been termed the "systems approach" to surgical performance.[10,11] According to the systems approach, surgical performance is a (direct or indirect) function of:

- Individual surgical skills: these include what has traditionally been termed "technical skill" (eg, motor co-ordination), but also cognitive skills (eg, decision-making).[12–14]
- Teamwork in the OR: teamworking skills include communication with other surgeons and other allied Health Professionals (anesthesiologists, nurses), situational awareness, leadership, and other behavioral skills.[12,15–17]
- OR environment: the surgical environment can be more or less conducive to effective surgical (team-)working.[18–21]

To assess quantitatively the impact, direct or indirect, of teamwork on surgical performance, it is necessary to have a comprehensive and robust tool that assesses teamwork of an entire OR team in real time. The Observational Teamwork Assessment for Surgery (OTAS)[22–24] aims to be such a comprehensive and robust measure of teamwork in surgery. OTAS consists of the following 2 parts:

1. Teamwork-related task checklist: the checklist comprises (i)

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Reliability of a revised NOTECHS scale for use in surgical teams

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KEYWORDS:
Surgical education;
surgical training;
surgical simulation;

Abstract

BACKGROUND: Recent developments in the surgical literature highlight the need for assessment of nontechnical skills in surgery. We report a revision of the NOn-TECHnical Skills (NOTECHS) scale of the aviation industry for use in surgery and detailed analysis on its reliability.

[illegible]eration, (2) Leadership and Managerial [illegible] Making. We added a Communication [illegible]rgical context. Reliability was assessed

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OBSERVATIONAL TEAMWORK ASSESSMENT FOR SURGERY©

Surgical Team – Intra-Operative Phase

RATING ANCHORS	BRIEF ANCHOR DEFINITION
6	Exemplary behaviour; very highly effective in enhancing team function
5	Behaviour enhances highly team function
4	Behaviour enhances moderately team function
3	Team function neither hindered nor enhanced by behaviour
2	Slight detriment to team function through lack of/inadequate behaviour
1	Team function compromised through lack of/inadequate behaviour
0	Problematic behaviour; team function severely hindered

BEHAVIOUR	DEFINITION	RATING SCALE						
COMMUNICATION	Quality and quantity of information exchanged among team members	0	1	2	3	4	5	6
COORDINATION	Management and timing of activities and tasks	0	1	2	3	4	5	6
COOPERATION/ BACK UP BEHAVIOUR	Assistance provided among members of the team, supporting others, and correcting errors	0	1	2	3	4	5	6
LEADERSHIP	Provision of directions, assertiveness, and support among members of the team	0	1	2	3	4	5	6
MONITORING/ SITUATIONAL AWARENESS	Team observation and awareness of ongoing processes	0	1	2	3	4	5	6

	EXAMPLE/SAMPLE BEHAVIOURS
COMMUNICATION	Asks team if all prepared to begin the operation Requests and instructions to team communicated clearly and effectively Provides information to whole team on progress Surgeon informs the team of technical difficulties and /or changes of plan
COORDINATION	Gives prior notification of requirements to Scrub Nurse to enhance timing of instrument ex change Surgeons co-ordinate use of equipment, such as camera in minimal access surgery providing adequate view of operating field Contribute to smooth exchange of instruments and provisions with Scrub Nurse
COOPERATION/ BACK UP BEHAVIOUR	Reacts positively to questions and requests from Nursing group Responds to requests or questions from Anaesthetic group Helps with smooth instrument exchange with Scrub Nurse Supports Surgical group assistants and compensates for lack of experience
LEADERSHIP	Instructions and explanations provided to assistants Advises Anaesthetist if unfamiliar with operative techniques (e.g. tube insertion) to call for senior help Supervision provided for staff lacking familiarity with tasks or equipment
MONITORING/ SITUATIONAL AWARENESS	Check table positioning and positions of members Assistants monitor direction of light Checks team condition Aware of patient condition including anaesthesia

Table 1 Revised NOTECHS scale for the surgical group

Subscales	Items
Communication and Interaction	A1. Instructions to assistant clear and polite
	A2. Waited for acknowledgement from assistant
	A3. Instructions to scrub nurse clear and polite
	A4. Waited for acknowledgement from scrub nurse
Situation Awareness and Vigilance	B1. Monitored patient parameters throughout procedure
	B2. Awareness of anesthetist
	B3. Actively initiates communication with anesthetist during crisis
Cooperation and Team Skills	C1. Maintains positive rapport with whole team
	C2. Open to opinions from other team members
	C3. Acknowledges contribution from other team members
	C4. Supportive of other team members
	C5. Conflict handling (concentrating on what is right rather than who is right)
Leadership and Managerial Skills	D1. Adherence to best-practice during procedure (eg, does not permit corner cutting)
	D2. Time management (eg, not being too slow or rushing other team members)
	D3. Resource utilization (eg, appropriate task load distribution and delegation of responsibilities)
	D4. Debriefing the team (eg, provides details and feedback to the team about procedure)
	D5. Authority and assertiveness
Decision Making	E1. Prompt identification of the problem
	E2. Informed team members promptly and clearly
	E3. Outlines strategy and institutes a plan (eg, asks scrub nurse for suction, instruments, suture material)
	E4. Anticipates potential problems and prepares contingency plan (eg, ask anesthetist to order blood, call for help)
	E5. Option generation (eg, takes help from others, seeks team's opinion)

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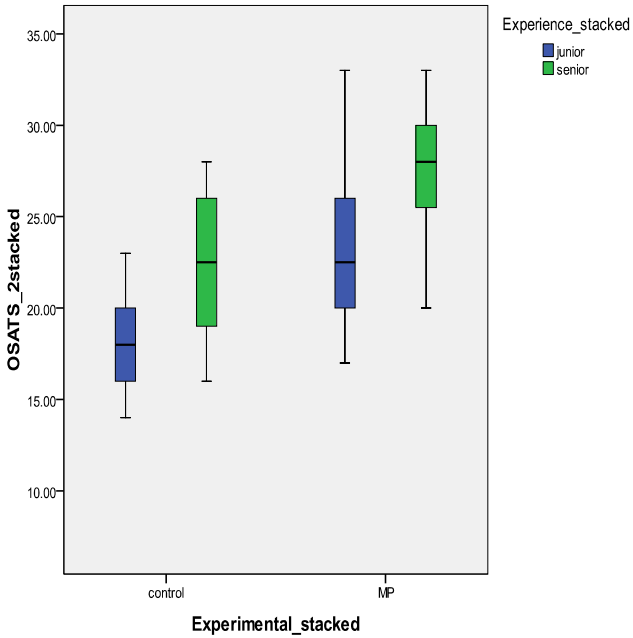

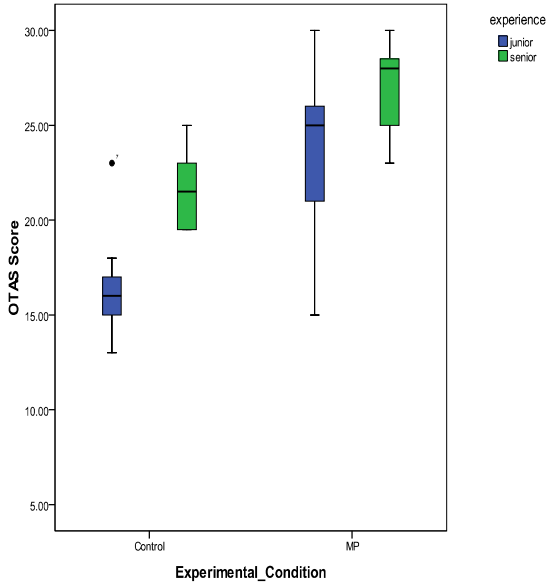

Arora et al, 2011

Further Information

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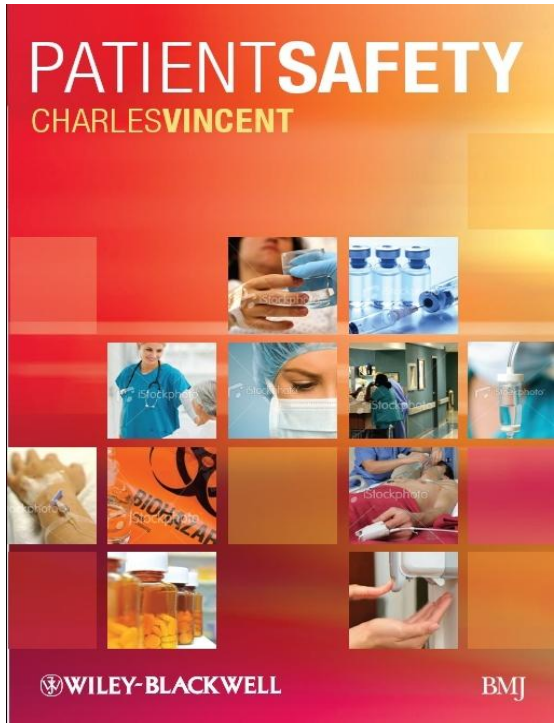

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