Implementing Care Bundles

Dr Ling Moi Lin
Director, Infection Control
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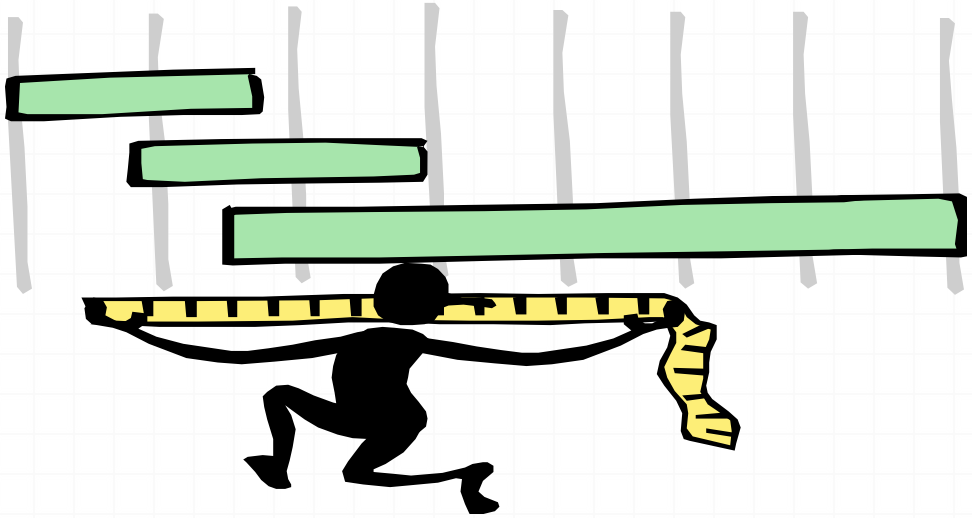
What is Reliability?

- The extent to which a system yields the same results on repeated trials



Six Sigma — One Measure of Reliability

Process Sigma	Defects per 1,000,000
6	3.4
5	233
4	6,210
3	66,807
2	308,538
1	691,462

Healthcare's Reliability Gap

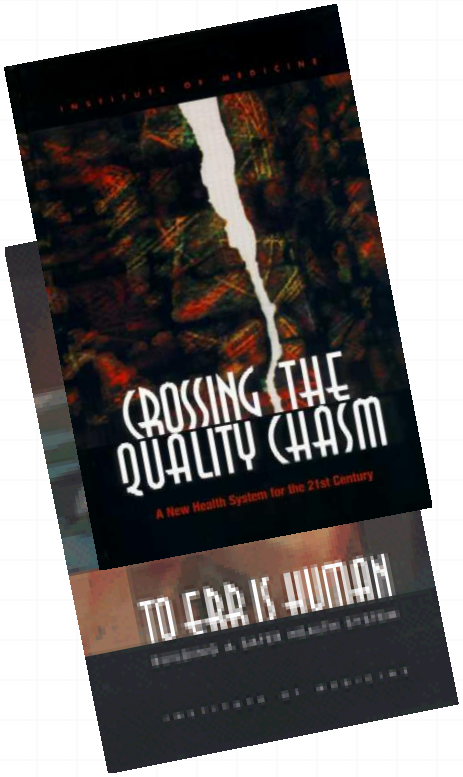
- World-class manufacturing dictates defect rates in the 5-6 sigma range.
- The airlines are achieving better than 6-sigma range with 0.43 deaths/million.
- Health-care measures generally fall into the 2-4 sigma range.

Merry & Brown, 2002

Healthcare's Reliability Gap

- 44,000 – 98,000 annual deaths from errors in healthcare (IOM, 1999).

- Health-care errors are the 7th leading cause of death (Kohn, Corrigan & Donaldson, 1999).



Healthcare errors

- Failure to diagnose / incorrect diagnosis
- Failure to utilise or act on diagnostic tests
- Inappropriate use or outmoded diagnostic tests / treatments
- Failure to monitor or provide follow-up
- Wrong site surgery, medication errors
- Transfusion mistakes

Healthcare errors

- **Healthcare associated infections**
- Patients falls
- Pressure sores
- Phlebitis associated with intravenous lines
- Restraint related strangulation
- Preventable suicides
- **Failure to provide prophylaxis**

Comparing healthcare with aviation

- Anaesthetists and intensivists - like pilots
  - monitor under routine condition and intervene in emergencies
- Surgeons, physicians and nurses - like engineers and maintainers
  - hands-on repair work and fewer engineered defences
  - high error opportunity

The Role of Complexity
In Reducing Performance

The Probability of Performing Perfectly

No of Steps	0.95	0.99	0.999	0.999999
1	0.95	0.990	0.999	0.999999
25	**0.28**	**0.78**	**0.98**	**0.998**
50	0.08	0.61	0.95	0.95
100	0.006	0.37	0.90	0.99

Why did it happen?

- Many and varied interactions with technology e.g. infusion pumps
- Many care-givers; multiple hand-offs
- High acuity of illness / injury
- Environment prone to distraction
- Need to make quick decisions; time-pressured,
- High volume, unpredictable patient load

Key reasons

- Patients are more at risk than non-patients
- Medical interventions are, by their nature, high-risk procedures - small error margins
- Medicine remains an inexact, hands-on endeavour

So many non compliances

The NEW ENGLAND JOURNAL of MEDICINE

SPECIAL ARTICLE

The Quality of Health Care Delivered to Adults in the United States

Elizabeth A. McGlynn, Ph.D., Steven M. Asch, M.D., M.P.H., John Adams, Ph.D., Joan Keesey, B.A., Jennifer Hicks, M.P.H., Ph.D., Alison DeCristofaro, M.P.H., and Eve A. Kerr, M.D., M.P.H.

N Engl J Med 2003; 348:2635-2645

ABSTRACT

BACKGROUND

We have little systematic information about the extent to which standard processes involved in health care — a key element of quality — are delivered in the United States.

METHODS

We telephoned a random sample of adults living in 12 metropolitan areas in the United States and asked them about selected health care experiences. We also received written consent to copy their medical records for the most recent two-year period and used this information to evaluate performance on 439 indicators of quality of care for 30 acute and chronic conditions as well as preventive care. We then constructed aggregate scores.

RESULTS

Participants received 54.9 percent (95 percent confidence interval, 54.3 to 55.5) of recommended care. We found little difference among the proportion of recommended preventive care provided (54.9 percent), the proportion of recommended acute care provided (53.5 percent), and the proportion of recommended care provided for chronic conditions (56.1 percent). Among different medical functions, adherence to the processes involved in care ranged from 52.2 percent for screening to 58.5 percent for follow-up care. Quality varied substantially according to the particular medical condition, ranging from 78.7 percent of recommended care (95 percent confidence interval, 73.3 to 84.2) for senile cataract to 10.5 percent of recommended care (95 percent confidence interval, 6.8 to 14.6) for alcohol dependence.

CONCLUSIONS

The deficits we have identified in adherence to recommended processes for basic care pose serious threats to the health of the American public. Strategies to reduce these deficits in care are warranted.

The NEW ENGLAND JOURNAL of MEDICINE

Table 1. Selected Quality-of-Care Indicators and Classifications Used in the Community Quality Index Study.*

Condition†	Description of Selected Indicator	Classification for Aggregate Scores			
		Type of Care	Function	Mode	Problem with Quality
Alcohol dependence (5 indicators)					
Indicator 2	Assessment of alcohol dependence among regular or binge drinkers	For chronic condition	Diagnosis	History	Underuse
Indicator 4	Treatment referral for persons given a diagnosis of alcohol dependence	For chronic condition	Treatment	Encounter or other intervention	Underuse
Asthma (25 indicators)					
Indicator 4	Long-acting agents for patients with frequent use of short-acting beta-agonists	For chronic condition	Treatment	Medication	Underuse
Indicator 6	Inhaled corticosteroids for patients receiving long-term systemic corticosteroid therapy	For chronic condition	Treatment	Medication	Underuse
Breast cancer (9 indicators)					
Indicator 1	Appropriate follow-up of palpable mass	For chronic condition	Diagnosis	Laboratory testing or radiography	Underuse
Indicator 5	Choice of surgical treatments for stage I or II cancer	For chronic condition	Treatment	Surgery	Underuse
Cerebrovascular disease (10 indicators)					
Indicator 4	Antiplatelet therapy for noncardiac stroke or transient ischemic attack	For chronic condition	Treatment	Medication	Underuse
Indicator 5	Carotid imaging for patients with symptomatic cardiovascular disease or transient ischemic attack	For chronic condition	Diagnosis	Laboratory testing or radiography	Underuse
Colorectal cancer (12 indicators)					
Indicator 1	Screening for high-risk patients starting at 40 yr of age	Preventive	Screening	Laboratory testing or radiography	Underuse
Indicator 7	Appropriate surgical treatment	For chronic condition	Treatment	Surgery	Underuse
Congestive heart failure (36 indicators)					
Indicator 1	Ejection fraction assessed before medical therapy	For chronic condition	Diagnosis	Laboratory testing or radiography	Underuse
Indicator 32	ACE inhibitors for patients with congestive heart failure and an ejection fraction <40%	For chronic condition	Treatment	Medication	Underuse
Coronary artery disease (37 indicators)					
Indicator 3	Counseling on smoking cessation	For chronic condition	Treatment	Counseling or education	Underuse
Indicator 11	Avoidance of nifedipine for patients with an acute myocardial infarction	For chronic condition	Treatment	Medication	Overuse
Diabetes (13 indicators)					
Indicator 9	Diet and exercise counseling	For chronic condition	Treatment	Counseling or education	Underuse
Indicator 12	ACE inhibitors for patients with proteinuria	For chronic condition	Treatment	Medication	Underuse

Surgical site infections (SSIs) and antimicrobial prophylaxis

- Despite evidence of effectiveness of antimicrobials to prevent SSIs, numerous studies have demonstrated inappropriate timing, selection, and excess duration of administration of antimicrobial prophylaxis
- 2965 acute care US hospitals
- An antimicrobial dose was administered to **55.7%** of patients within 1 hour before incision.
- Antimicrobial agents consistent with published guidelines were administered to **92.6%** of the patients.
- Antimicrobial prophylaxis was discontinued within 24 hours of surgery end time for only **40.7%** of patients.

ORIGINAL ARTICLE

Use of Antimicrobial Prophylaxis for Major Surgery

Baseline Results From the National Surgical Infection Prevention Project

Dale W. Bratzler, DO, MPH; Peter M. Houck, MD; Chesley Richards, MD, MPH; Lynn Steele, MS, CIC; E. Patchen Dellinger, MD; Donald E. Fry, MD; Claudia Wright, MS; Allen Ma, PhD; Karina Carr, RN; Lisa Red, MSHA

Hypothesis: Surgical site infections (SSIs) are a major contributor to patient injury, mortality, and health care costs. Despite evidence of effectiveness of antimicrobials to prevent SSIs, previous studies have demonstrated inappropriate timing, selection, and excess duration of administration of antimicrobial prophylaxis. We herein describe the use of antimicrobial prophylaxis for Medicare patients undergoing major surgery.

Design: National retrospective cohort study with medical record review.

Setting: Two thousand nine hundred sixty-five acute-care US hospitals.

Patients: A systematic random sample of 34 133 Medicare inpatients undergoing coronary artery bypass grafting; other open-chest cardiac surgery (excluding transplantation); vascular surgery, including aneurysm repair, thromboendarterectomy, and vein bypass operations; general abdominal colorectal surgery; hip and knee total joint arthroplasty (excluding revision surgery); and abdominal and vaginal hysterectomy from January 1 through November 30, 2001.

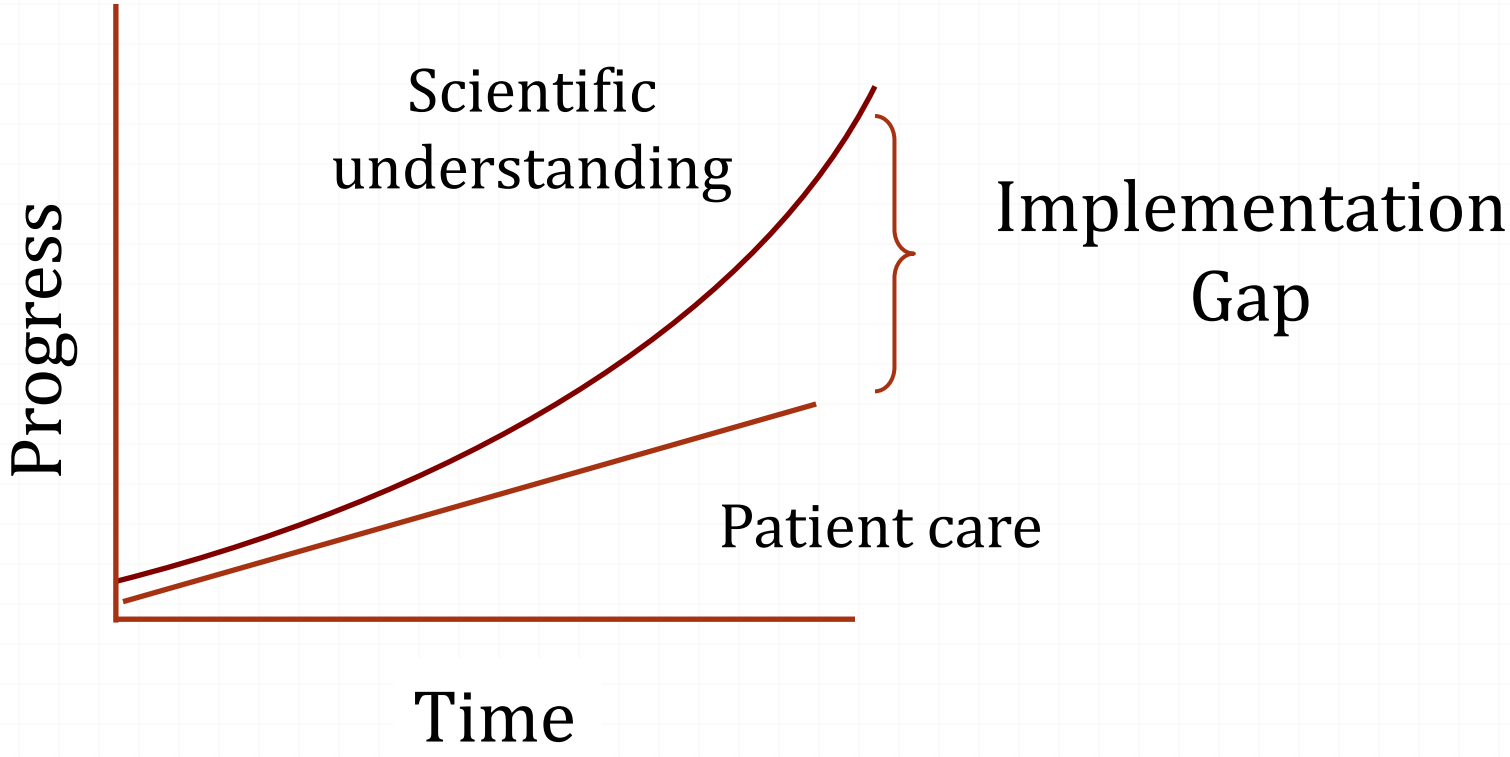
Main Outcome Measures: The proportion of patients who had parenteral antimicrobial prophylaxis initiated within 1 hour before the surgical incision; the proportion of patients who were given a prophylactic antimicrobial agent that was consistent with currently published guidelines; and the proportion of patients whose antimicrobial prophylaxis was discontinued within 24 hours after surgery.

Results: An antimicrobial dose was administered to 55.7% (95% confidence interval [CI], 54.8%-56.6%) of patients within 1 hour before incision. Antimicrobial agents consistent with published guidelines were administered to 92.6% (95% CI, 92.3%-92.8%) of the patients. Antimicrobial prophylaxis was discontinued within 24 hours of surgery end time for only 40.7% (95% CI, 40.2%-41.2%) of patients.

Conclusion: Substantial opportunities exist to improve the use of prophylactic antimicrobials for patients undergoing major surgery.

Arch Surg. 2005;140:174-182

Quality Improvement: Bridging the Implementation Gap

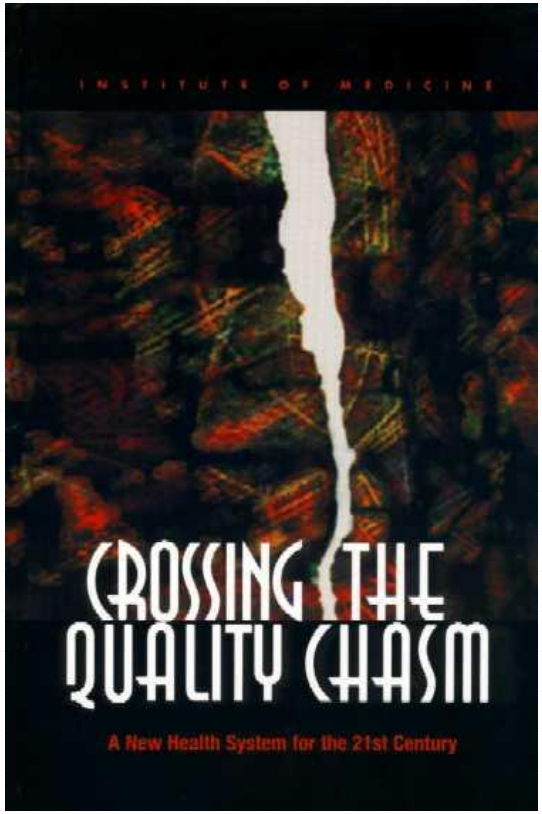


Hierarchy of Reliability

Level		Predicted Success rate
1	No protocol ("State of Nature")	40%
2	Decision support exists but not linked to order writing, or prompts within orders but no decision support	50%
3	Protocol well-integrated (into orders at point-of-care)	65-85%
4	Protocol enhanced (by other QI and high reliability strategies)	90%
5	Oversights identified and addressed in real time	95+%

Characteristics of a Quality Healthcare System when the Appropriate Systems are in Place

- It is safe
- It is effective
- It is efficient
- It is patient centered
- It is equitable
- It is timely



Care Bundles

- A small set of practices individually proven to improve patient outcomes and when implemented together are expected to result in a better outcome than when implemented individually
- Consist of 3 – 6 elements, which are well established practices that are not being delivered consistently
- To improve consistency, these practices are then packaged together into a 'bundle' that should be delivered by one healthcare team at one point in time to every patient meeting the bundle criteria

- **Prevent Central Line Infections**...by implementing a series of interdependent, scientifically grounded steps called the "Central Line Bundle”

- **Prevent Surgical Site Infections**...by reliably delivering the correct perioperative antibiotics at the proper time

- **Prevent Ventilator-Associated Pneumonia**...by implementing a series of interdependent, scientifically grounded steps including the "Ventilator Bundle"

- **Reduce Methicillin-Resistant *Staphylococcus aureus* (MRSA) infection** through basic changes in infection control processes throughout the hospital

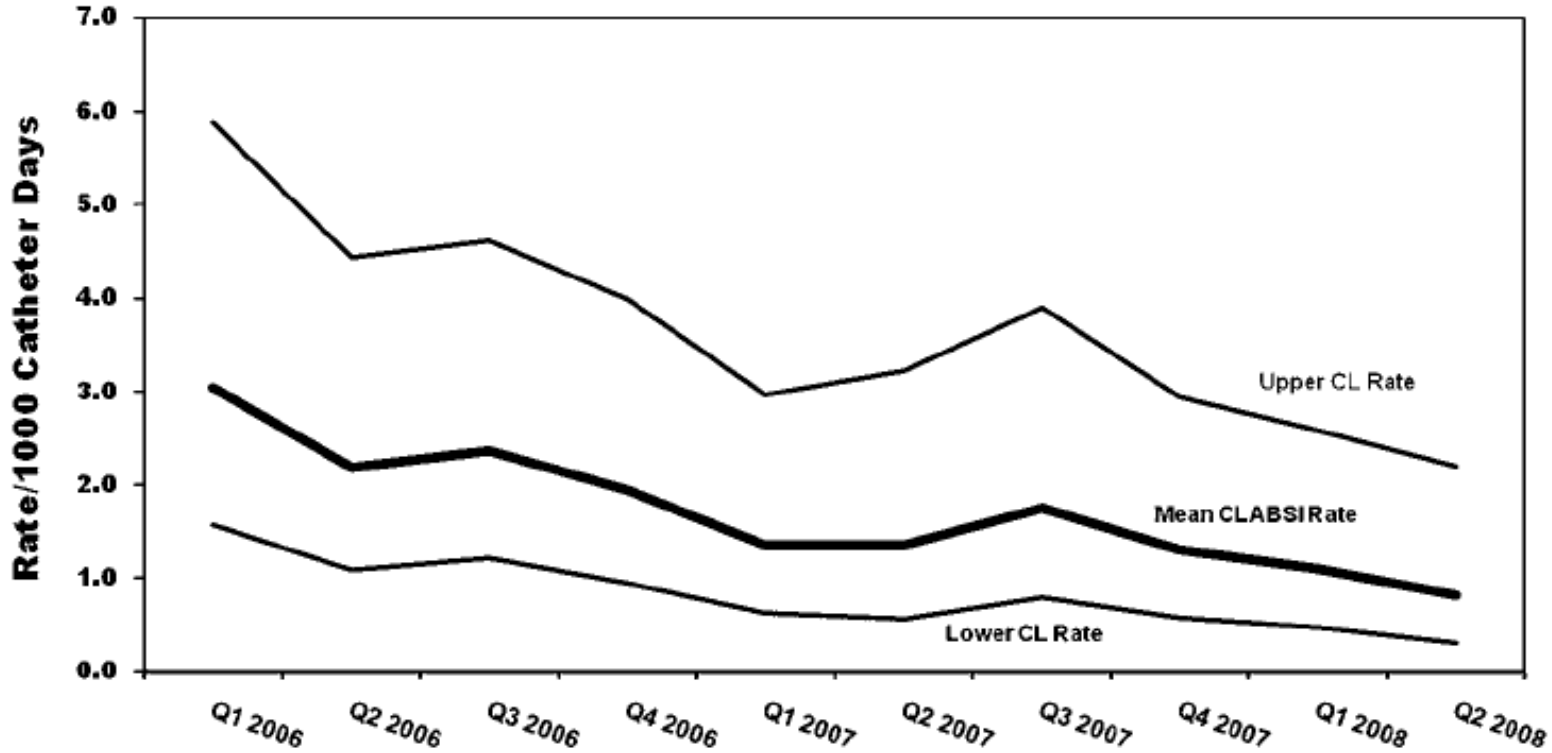
- **Reduce Surgical Complications** by reliably implementing the changes in care recommended by the Surgical Care Improvement Project (SCIP)

The Rhode Island ICU collaborative: a model for reducing central line-associated bloodstream infection and ventilator-associated pneumonia statewide

Vera A DePalo,[1,2] Lynn McNicoll,[1,3,4] Margaret Cornell,[4] Jean Marie Rocha,[5] Laura Adams,[6] Peter J Pronovost[7]

- 100% of 23 ICUs in 11 hospitals participated in the Collaborative
- The statewide mean CLABSI rate decreased 74% from 3.73 (median 1.95) infections per 1000 catheter days to 0.97 (median 0) in Q2 (March - June) 2008 ($p<0.0032$)
- The VAP rate fell 15% from 3.44 (median 0.58) to 2.92 VAPs (median 0) per 1000 ventilator days in Q2, 2008

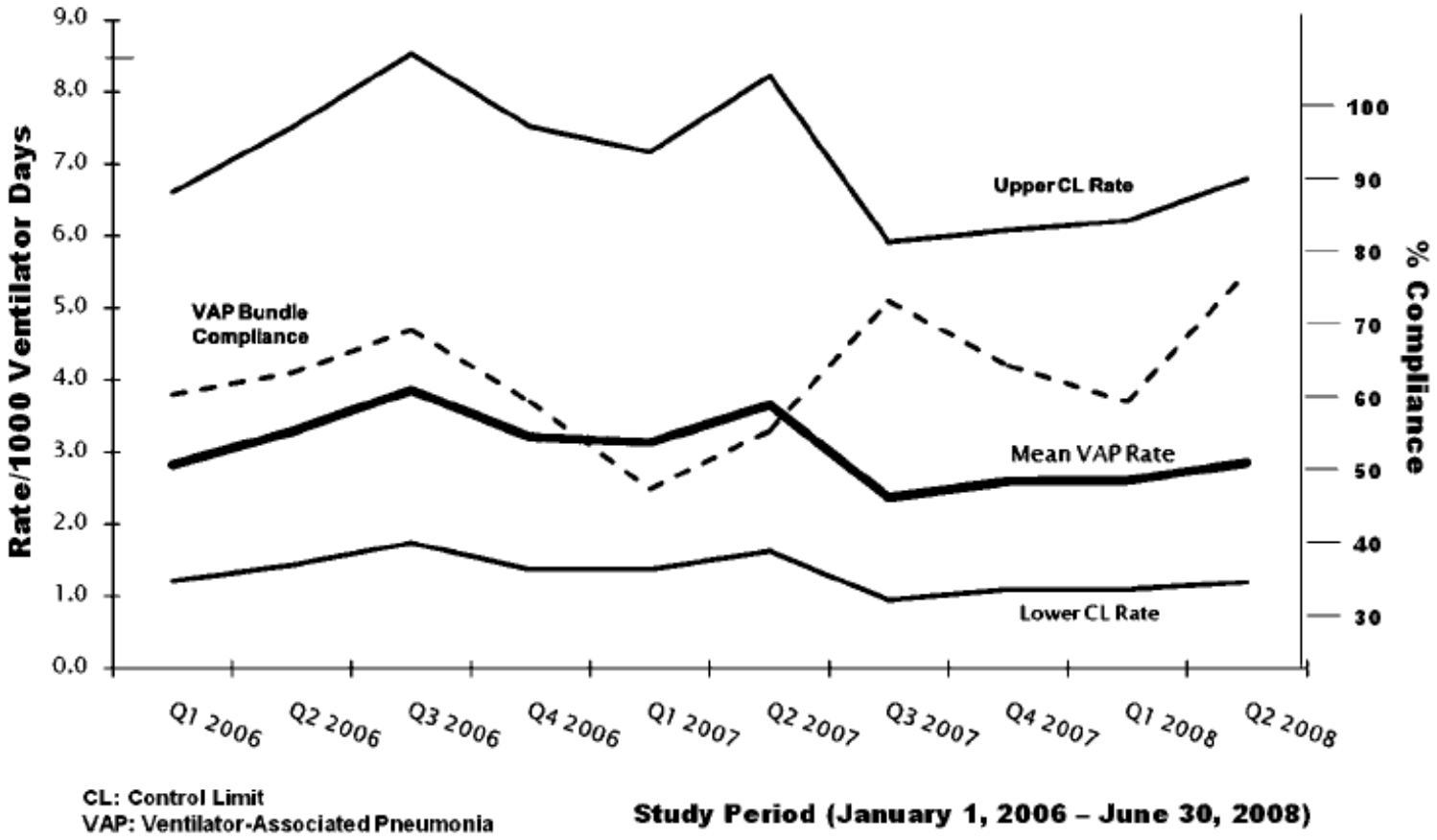
Mean CLABSI rates



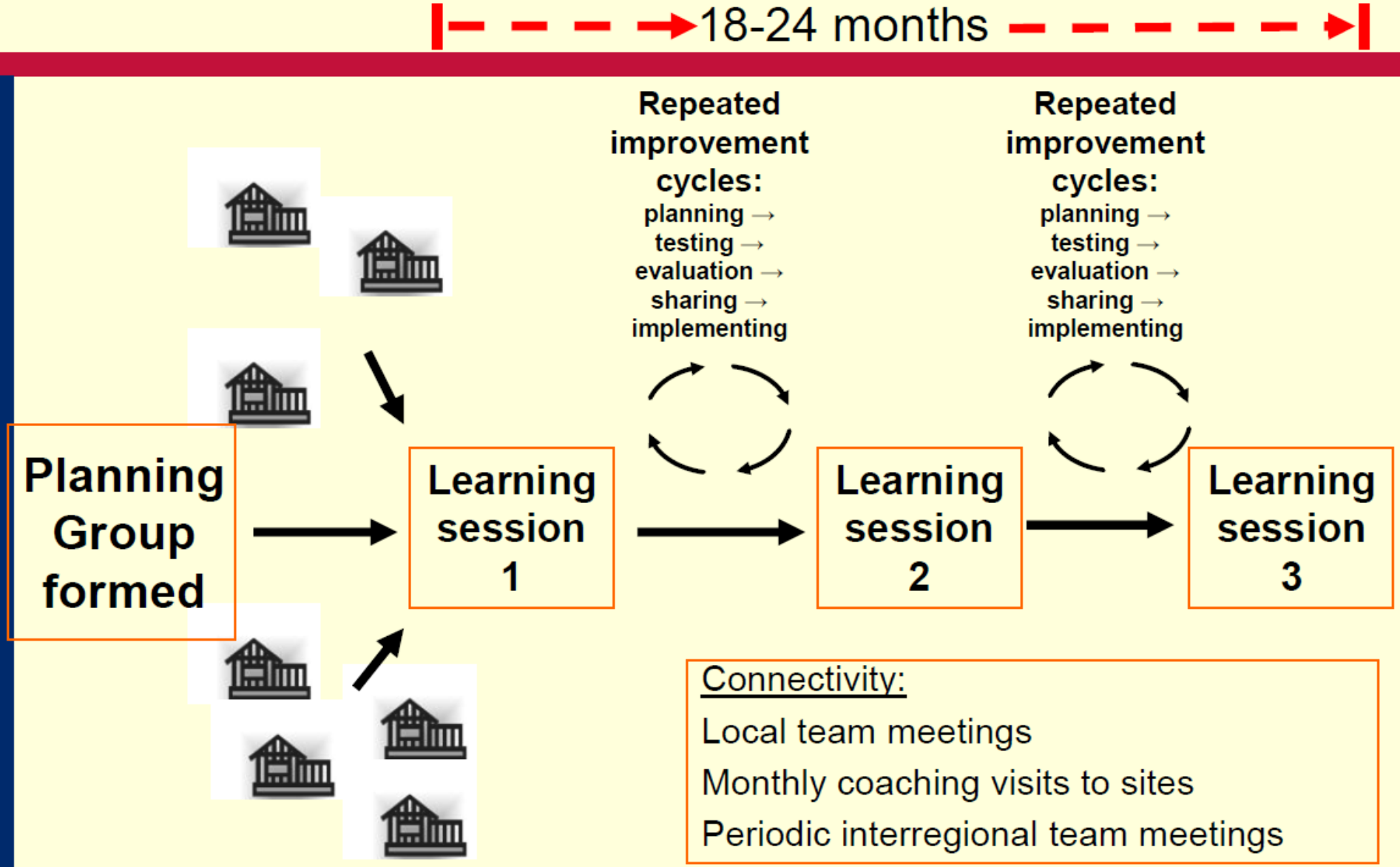
CL: Control Limit
CLABSI: Central Line–Associated Blood Stream Infection

Study Period: (January 1, 2006 to June 30, 2008)

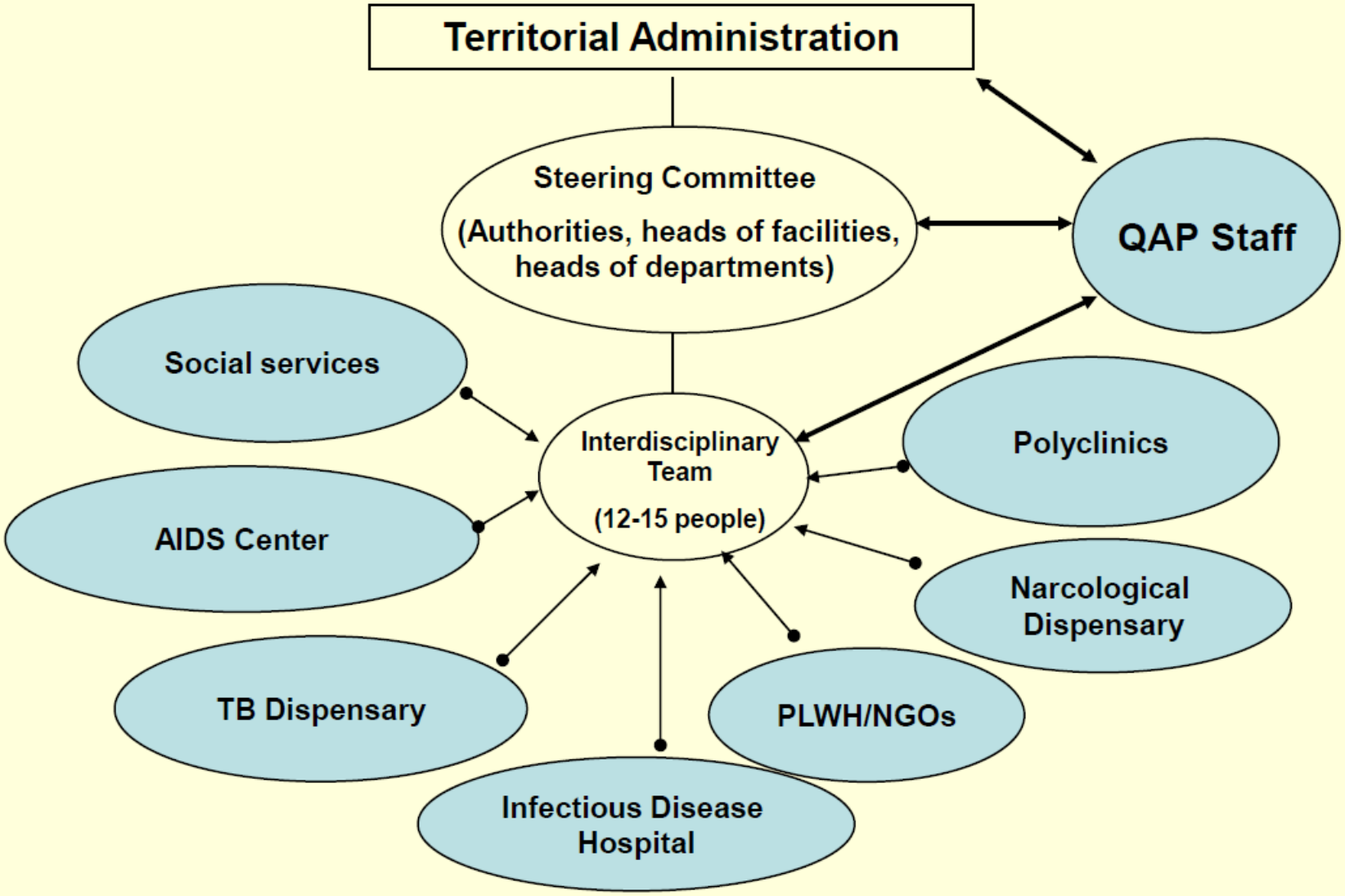
Mean VAP rates



Improvement Collaborative Model



Collaborative Structure



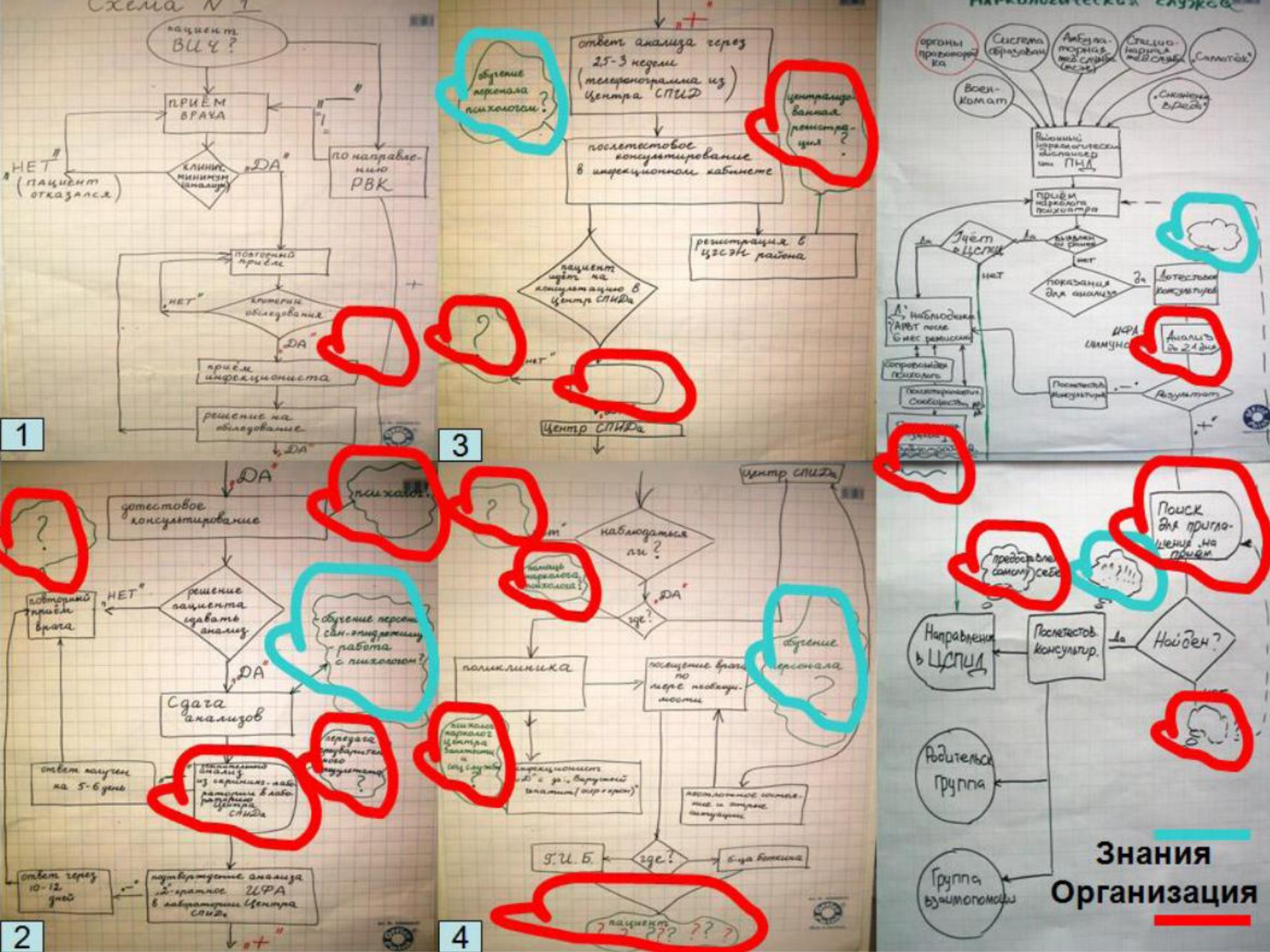
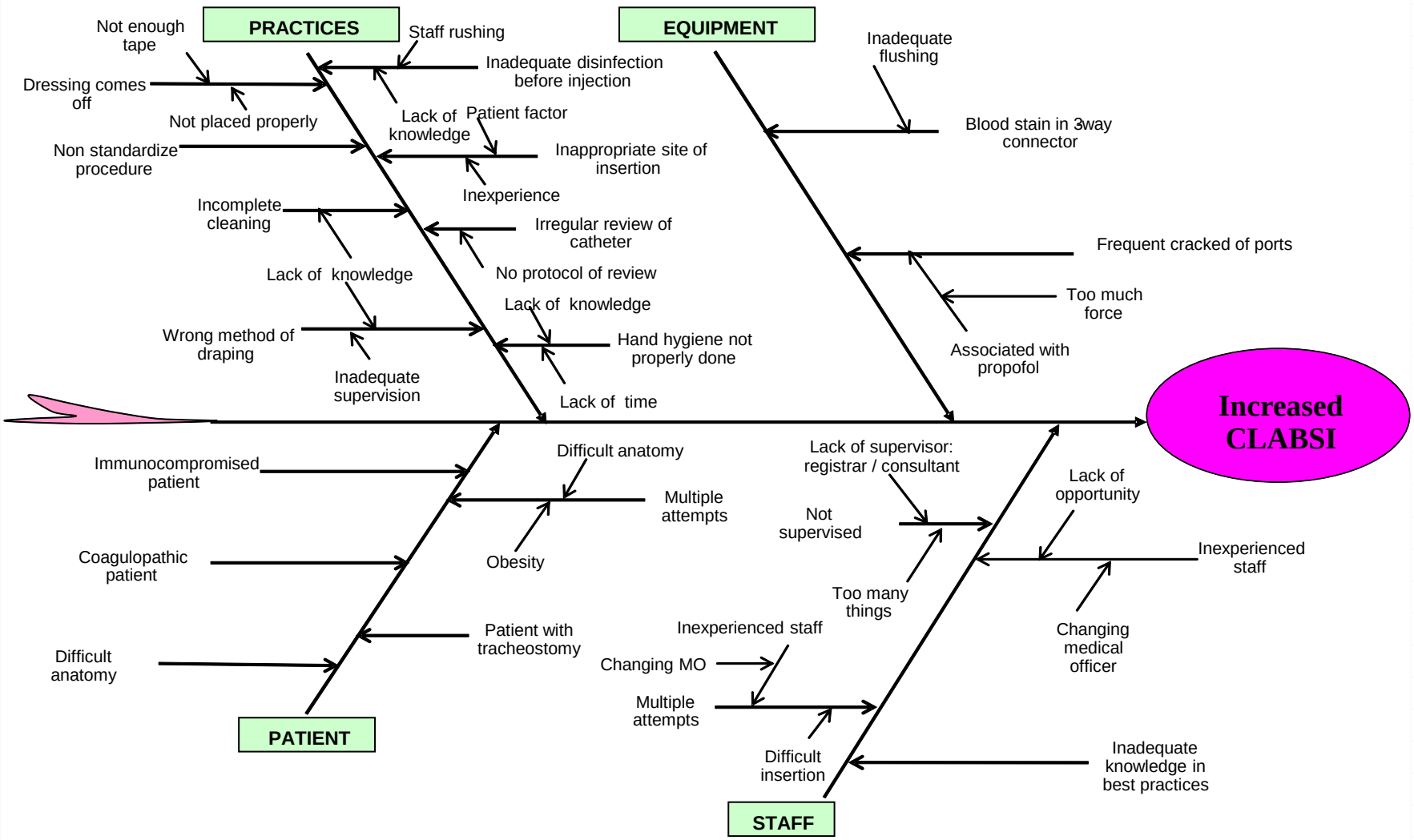


Схема № 1
пациент ВИЧ?
ПРИЁМ ВРАЧА
клинич. минимум анализ
НЕТ (пациент отказался)
ДА
по направлению РВК
повторный приём
критерии обследования
НЕТ
ДА
приём инфекциониста
решение на обследование
ДА
1
ответ анализа через 25-3 недели (телеграмма из Центра СПИД)
обучение персонала психологом?
централизованная регистрация?
послетестовое консультирование в инфекционном кабинете
регистрация в ЦГСЭН района
пациент идёт на консультацию в центр СПИДа
НЕТ
Центр СПИДа
3
дотестовое консультирование
психолог?
решение пациента сдавать анализ
НЕТ
повторный приём врача
ДА
обучение персонала сан-эпидрежиму
работа с психологом?
Сдача анализов
ответ получен на 5-6 день
передача документального результата
подтверждение анализа 2-кратное ИФА в лаборатории Центра СПИДа
ответ через 10-12 дней
2
Центр СПИДа
наблюдаться ли?
ДА
где?
поликлиника
посещение врача по мере необходимости
обучение персонала
психолог, нарколог, центра занятости и соц. служб
инфекционист
настоятельное отношение к острой ситуации
Э.И.Б.
где?
б-ца Боткина
пациент
4
наркологических служб
органы правопорядка
Система образования
Амбулаторная наркологическая служба
Стационарная наркологическая служба
Самотёк
Военкомат
Снижение вреда
Районный наркологический диспансер или ПНД
приём нарколога, психиатра
Учёт в ЦСПИД
выявлен по ранее
нет
показания для анализа
дотестовое консультирование
ИФА иммуно
Анализ до 21 дня
Наблюдение АРВТ после 6 мес ремиссии
Сопровождение психолога
Психотерапевтическое сообщество
Послетестовое консультирование
Результат
Поиск для приглашения на приём
предоставление самому себе
Направление в ЦСПИД
Послетестов. консультир.
Найден?
Родительская группа
Группа взаимопомощи
Знания
Организация

Cause and effect diagram



Overall concepts
Envision the problem within the larger healthcare system
Engage collaborative multidisciplinary teams centrally (stages 1-3) and locally (stage 4)

1. Summarise the evidence
Identify interventions associated with improved outcomes
Select interventions with the largest benefit and lowest barriers to use
Convert interventions to behaviours

2. Identify local barriers to implementation
Observe staff performing the interventions
"Walk the process" to identify defects in each step of implementation
Enlist all stakeholders to share concerns and identify potential gains and losses associated with implementation

3. Measure performance
Select measures (process or outcome)
Develop and pilot test measures
Measure baseline performance

4. Ensure all patients receive the interventions
Implement the "four Es" targeting key stakeholders from front line staff to executives

Engage
Explain why the interventions are important

Educate
Share the evidence supporting the interventions

Execute
Design an intervention "toolkit" targeted at barriers, standardisation, independent checks, reminders, and learning from mistakes

Evaluate
Regularly assess for performance measures and unintended consequences

Pronovost et al

BMJ | 25 OCTOBER 2008 | VOLUME 337

Singapore General Hospital
SingHealth

Prevention of Central line-associated Bloodstream Infections (CLABSI)

Infection Control Department

PATIENTS. AT THE HEART OF ALL WE DO.®

Quiz: Prevention of CLABSI

You have completed all the modules in Prevention of CLABSI. Now it is time to see how much you have learned.
Are you ready to take the quiz?
Please click on "GO" button to take the quiz.

GO!

Singapore General Hospital
SingHealth

Menu

- Main Page
- Introduction
- Epidemiology
- Signs and symptoms of VAP
- Contributing Risk Factors for Acquiring VAP
- Etiology of VAP
- Risk Factors
  - Risk Factors: Bacterial Colonization
  - Risk Factors: Aspiration
  - Risk Factors: Equipment Contamination
- Preventive Measures
  - 1. Prevention of Bacterial Colonization
  - 2. Prevention of Aspiration
  - 3. Prevention of Equipment Contamination
- About VAP Bundle
  - The VAP Bundle
  - VAP Game

Search...

Prevention of Ventilator-Associated Pneumonia (VAP)

Singapore General Hospital
SingHealth

Prevention of Ventilator-Associated Pneumonia (VAP)

Infection Control Department

PATIENTS. AT THE HEART OF ALL WE DO.®

NEXT >

Singapore General Hospital
SingHealth

Menu

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  - The VAP Bundle
  - VAP Game
- Conclusion
- Quiz
- Credits Page

Prevention of Ventilator-Associated Pneumonia (VAP)

The VAP Game Results

Your Result:

★★★★

Congratulations, you have passed.

Your Score: 100%

Passing Score: 75%

Review Quiz | Retry Quiz

Next

CLABSI Bundle (IHI)

- Hand hygiene *(surgical hand hygiene)*
- Maximal barrier precautions
- *2%* Chlorhexidine *with IPA* skin antisepsis
- Optimal catheter site selection, with subclavian vein as the preferred site for non-tunneled catheters
- Daily review of line necessity, with prompt removal of unnecessary lines

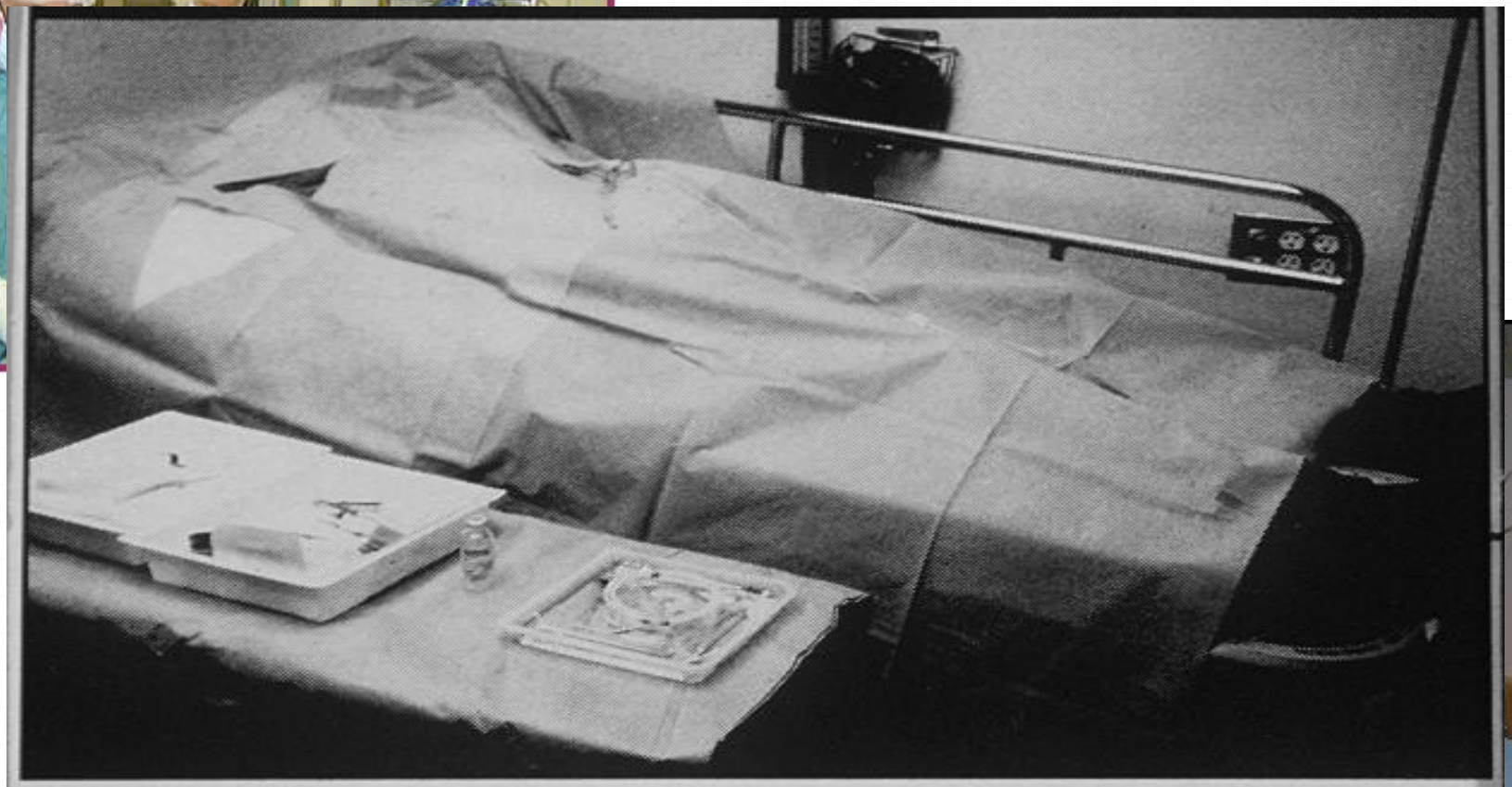


FIGURE 1A. The large drape used in the maximal barrier arm consisted of a full body drape that covered the patient's head and body.

CLABSI Maintenance Bundle

- Needleless connector
- Scrub hub > = 15 sec with CHG alcohol or alcohol
- Antiseptic or AB impregnated catheter
- Biopatch
- AB or antiseptic lock
- CHG baths
- Outside ICU – use IV Team

Moving from Bundles to Checklist

Surgical Safety Checklist

World Health Organization | Patient Safety
A World Alliance for Safer Health Care

Before induction of anaesthesia

(with at least nurse and anaesthetist)

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

Is the site marked?
- ☐ Yes
- ☐ Not applicable

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

Is the pulse oximeter on the patient and functioning?
- ☐ Yes

Does the patient have a:

Known allergy?
- ☐ No
- ☐ Yes

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

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

Before skin incision

(with nurse, anaesthetist and surgeon)

- ☐ **Confirm all team members have introduced themselves by name and role.**
- ☐ **Confirm the patient's name, procedure, and where the incision will be made.**

Has antibiotic prophylaxis been given within the last 60 minutes?
- ☐ Yes
- ☐ Not applicable

Anticipated Critical Events

To Surgeon:
- ☐ What are the critical or non-routine steps?
- ☐ How long will the case take?
- ☐ What is the anticipated blood loss?

To Anaesthetist:
- ☐ Are there any patient-specific concerns?

To Nursing Team:
- ☐ Has sterility (including indicator results) been confirmed?
- ☐ Are there equipment issues or any concerns?

Is essential imaging displayed?
- ☐ Yes
- ☐ Not applicable

Before patient leaves operating room

(with nurse, anaesthetist and surgeon)

Nurse Verbally Confirms:
- ☐ The name of the procedure
- ☐ Completion of instrument, sponge and needle counts
- ☐ Specimen labelling (read specimen labels aloud, including patient name)
- ☐ Whether there are any equipment problems to be addressed

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

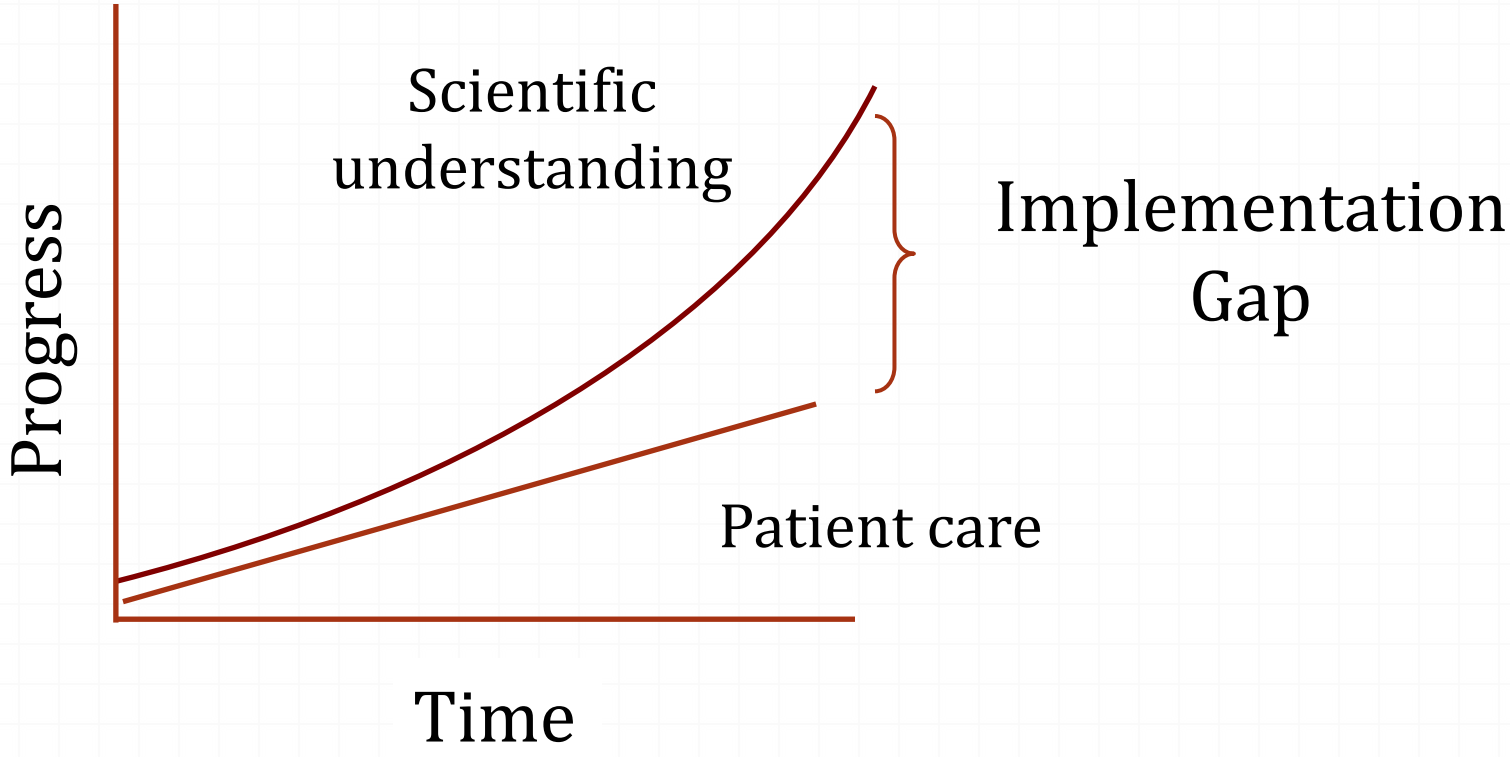
This checklist is not intended to be comprehensive. Additions and modifications to fit local practice are encouraged.

Revised 1 / 2009

Implementation

- Task work
  - Behaviours that are related to task execution, such as the interaction with medical equipment - and instruments
- Teamwork
  - How team members organize their joint actions
    - Designating roles, determining the timing of activities, coordinating action, and managing interpersonal factors, such as decision making and conflict resolution

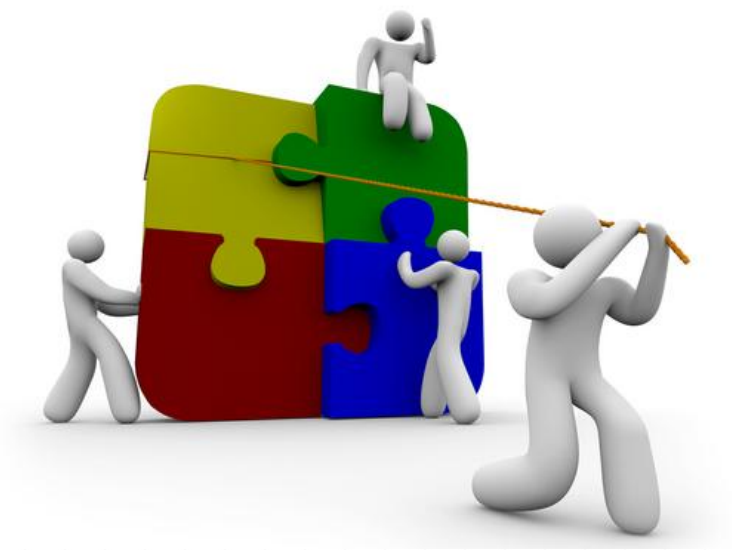
Quality Improvement: Bridging the Implementation Gap




SUCCESS

Implementation: Success factors

- Quality improvement approach
  - Multidisciplinary team
  - PDCA model
  - Element of measurement for assessment / evaluation
- Quality & safety culture



Comprehensive Unit-based Safety Program (CUSP)

- A 5-step program designed to change a unit's workplace culture
- Brings about significant safety improvement by empowering staff to assume responsibility for safety in their environment
  - Achieved through education, awareness, access to organization resources and a toolkit of interventions

Comprehensive Unit-based Safety Program (CUSP)

- Train staff in the science of safety
  - understand that safety is a property of the system
  - understand the basic principles of safe design that include: standardize work, create independent checks (checklists) for key processes, and learn from mistakes
  - recognize that the principles of safe design apply to teamwork as well as technical work
  - understand that teams make wise decisions when there is diverse and independent input
- Engage staff to identify defects
- Senior executive partnership/safety rounds
- Continue to learn from defects
  - What happened?
  - Why did it happen?
  - What did you do to reduce risk?
  - How do you know that risks were reduced?
- Implement tools for improvement

CUSP rolled out nationwide in USA to reduce HAIs

- Following success of the "Keystone Project"
  - >100 ICUs in Michigan using CUSP
  - CLABSI reduced by two-thirds within 3 months
    - Average ICU decrease its infection rate from 4 percent to 0
    - Over 18 months, the program saved more than 1,500 lives and nearly $200 million.

Pronovost P, et al. NEJM 2006;355:2725-32.

Success factors

- Commitment from the hospital CEO
- Project team that includes, at a minimum
  - Physician champion (2-4 hours/month)
  - Nurse champion (if not project leader)
  - Data coordinator
  - Hospital executive champion

Conclusion

- Bundles and checklists helped to standardize processes for better reliability
- Successful implementation calls for QI methodology

Thank you

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