

SURgical PATient Safety System (SURPASS)



Surpassing the Checklist: Effect of a Comprehensive Surgical Safety System on Patient Outcomes in the Netherlands

Basel, June 12, 2013

Prof. Marja Boermeester

Professor of Surgery, Clinical Epidemiologist

Academic Medical Center (AMC) Amsterdam, The Netherlands

Disclosure

Grants from

Baxter

Ipsen

Abbott

LifeCell

Glaxo Smith Kline



Core business

- acute abdomen
- acute pancreatitis
- chronic pancreatitis
- patient safety
- intestinal failure team
- reconstructive surgery
of abdominal catastrophes



Surgery of intestinal failure patients



Research group

m.a.boermeester@amc.nl

Peritonitis

[www.intestinalfailure.info]

Jordy Kiewiet

Saar Gans

Lidewine Daniels

Marjolein Leeuwenburgh

Cagdas Unlu

Jasper Atema

Aafke van Dijk

Pancreatitis [www.pancreatitis.nl]

Usama Ahmed Ali

Yama Issa

Anke Roeterdink (RN)

Bernadette Schutijser (RN)

Patient safety

Eveline Boeker

Kim Ram

Monica de Boer

Maya Ramrattan

[www.surpass-checklist.nl]



SURgical Patient Safety System

SURPASS checklist

- Proven safety effect
- Easy to use
- Takes only a few minutes per care provider

CULTURE: tick box vs check-list

Tick one of the following

[] **Tick box culture** - meaningless,
burdensome, bureaucracy

[] **Checklist culture** - quick, beautiful by simplicity,
innovative, life-saving genius



One bad. One good. And both, puzzlingly,
the same.

Michael Blastland – BBC News _ Aug 4 2011

Introduction

- Worldwide -

- Systematic review of 75.000 records¹
- AEs in **1 out of 11** patients
- **1 in 147** patients dies as a consequence of AE



Incidence AEs		9.2%
Preventable		43.8%
Outcome	No or minor disability	56.3%
	Temporary disability	19.1%
	Permanent disability	7.0%
	Death	7.4%

¹de Vries EN, Ramrattan MA, Smorenburg SM, Gouma DJ, Boermeester MA. QSHC 2008

Introduction

- Sweden -

- 1.2 million annual admissions
- 8,6% of all patients experience preventable AE (pAE)
 - 3.0% of pAEs contribute to death

		NL ²		Sweden ³
Incidence AEs		9.2%	5.7%	12.3%
Preventable		43.8%	40%	70%
Outcome	No or minor disability	56.3%	57%	54%
	Temporary disability	19.1%	26%	30%
	Permanent disability	7.0%	5%	11%
	Death	7.4%	7.8%	4.1%

¹de Vries EN, Ramrattan MA, Smorenburg SM, Gouma DJ, Boermeester MA. QSHC 2008.

²Zegers M et al (Nivel). QSHC 2008.

³Soop M, Fryksmark U, Koster M, Haglund B. Int J Q in Healthcare 2009.

Introduction

Provider	Surgical disciplines	59.7%
	Medical disciplines	24.1%
Location	Operating room	41.0%
	Ward room	25.1%
	Emergency room	3.0%
Type of event	Operation-related	39.6%
	Drug-related	15.1%

- Large proportion of AEs related to surgical specialties

Why do accidents occur?
- limitations of concentration / memory -



Patient safety

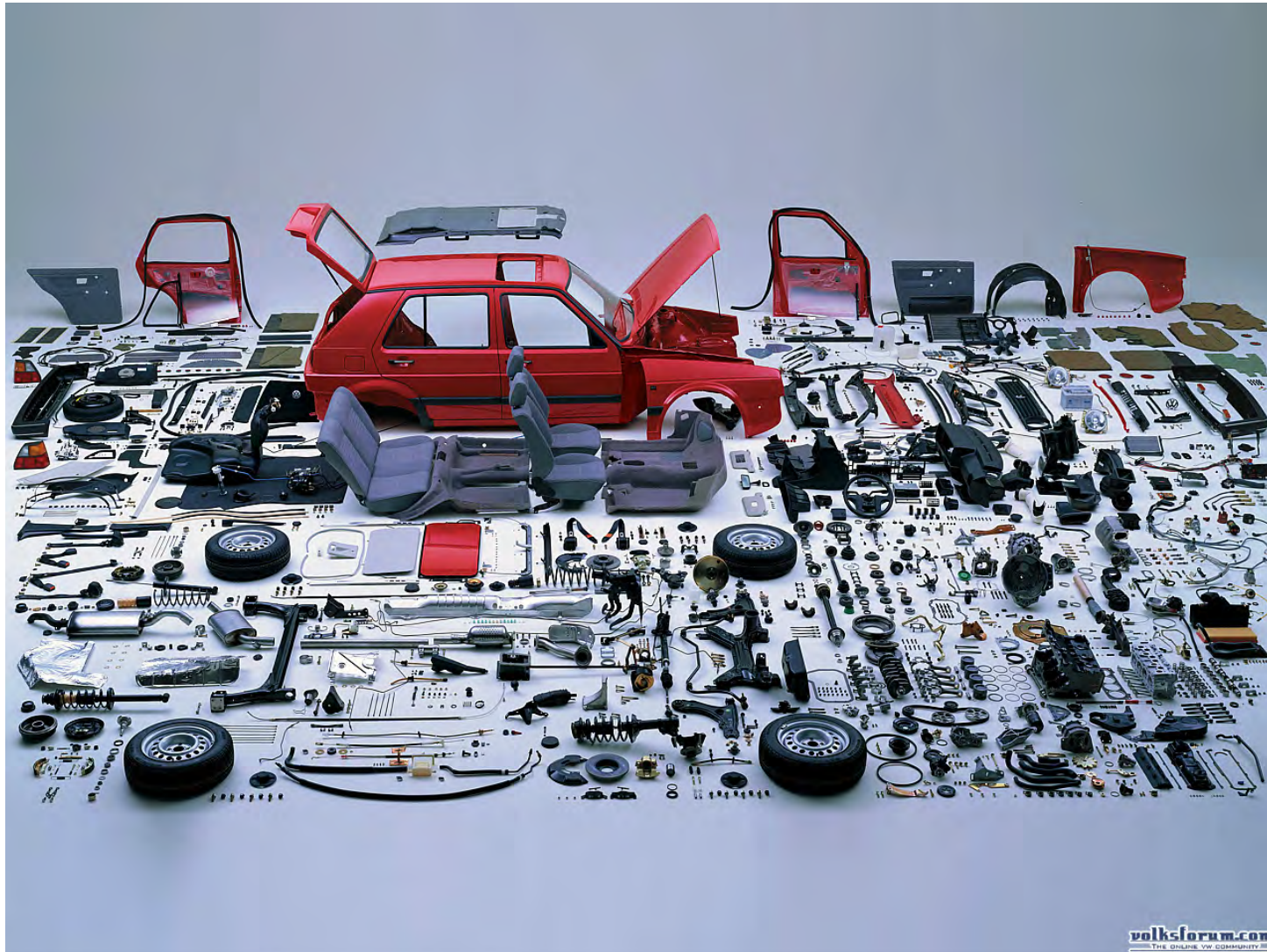
- surveillance of the surgical process -

rule-driven patient safety

→ **evidence based patient safety**

- intervention choices → prioritizing
- measurement of effectiveness of interventions

The making of a safety system: where to start?



Possible safety interventions

- super-specialist, getting even better at it
- clustering of low-volume / high-risk surgery
- training, simulators
- communication, crew resource management
- guidelines, protocols
- **checklists**

SURPASS checklist design started in 2004



SURgical Patient Safety System (SURPASS)

- standardizes surgical process
- avoids dependence of human memory
- formalizes individual responsibilities
- process steps and related checks integrated

key features of SURPASS

- ‘surgical patient pathway’
- focus on transfer moments
- multidisciplinary
 - ward doctor, ward nurse, recovery / ICU nurse, surgeon, anesthesiologist, scrub nurse

The making of SURPASS - Development 2004-2006-

- contents based on literature:
 - errors and complications in surgery
 - publications on surgical errors
 - complication data from Dutch National Surgical Complication Registration System
- checklist design based on human factors literature from aviation industry (structure, simple, generic, lay-out versus work flow etc.)
- result: theory-based (prototype) SURPASS checklist

Validation study

- Checking whether these theoretical safety risk events on the prototype checklist matched the safety risk events occurring in practice
- Deviation from optimal process (are not AEs)
 - 593 incidents in 171 surgical procedures

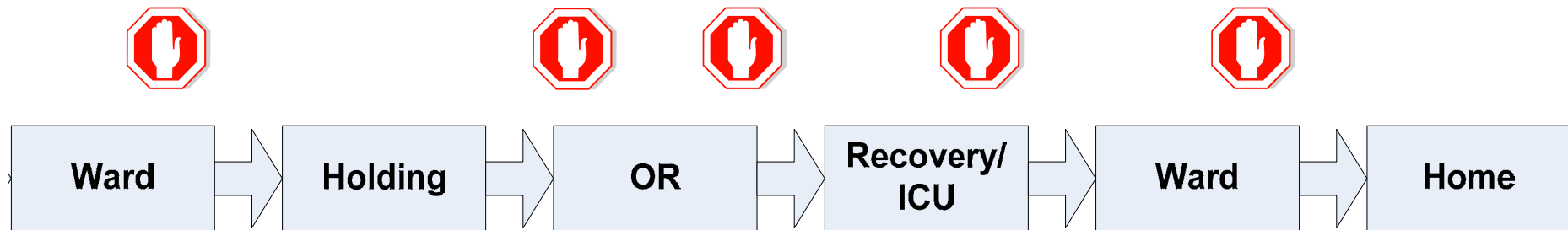
Incident [*]	Corresponding to item on checklist	Not corresponding to item on checklist	Not suitable for checklist
Total	441 (74%)	20 (3%)	132 (22%)

**Percentage of matching when considering
only incidents suitable for checklist use**

$$441 / (593 - 132) = 96\%$$

¹de Vries EN, Hollmann MW, Smorenburg SM, Gouma DJ, Boermeester MA. QSHC, 2009.

SURgical PATient Safety System (SURPASS)



A1
Preparation in OR
 Operating assistant: 4 items

A
Ward
 Ward doctor: 11 items
 Surgeon: 4 items
 Anaesthesiologist: 10 items
 Nurse: 10 items

B
Time out
 Surgeon,
 anaesthesiologist,
 OR assistant:
 16 items together

C
Postoperative instructions
 Surgeon: 5 items
 Anaesthesiologist: 4 items

D
Transfer to ward
 Anaesthesiologist: 7 items

E
Discharge
 Ward doctor: 10 items
 Nurse: 10 items

Statement 1

Checklists are only an extra
administrative burden

SURPASS Study

The NEW ENGLAND JOURNAL of MEDICINE

SPECIAL ARTICLE

Effect of a Comprehensive Surgical Safety System on Patient Outcomes

Eefje N. de Vries, M.D., Ph.D., Hubert A. Prins, M.D., Ph.D.,
Rogier M.P.H. Crolla, M.D., Adriaan J. den Outer, M.D.,*
George van Andel, M.D., Ph.D., Sven H. van Helden, M.D., Ph.D.,
Wolfgang S. Schlack, M.D., Ph.D., M. Agnès van Putten, B.Sc.,
Dirk J. Gouma, M.D., Ph.D., Marcel G.W. Dijkgraaf, Ph.D.,
Susanne M. Smorenburg, M.D., Ph.D., and Marja A. Boermeester, M.D., Ph.D.,
for the SURPASS Collaborative Group†

N ENGL J MED 363;20 NEJM.ORG NOVEMBER 11, 2010

Methods

- checklist implemented in 6 hospitals (2 tertiary referral centers/ 4 regional teaching hospitals)
- control group of 5 hospitals (1 tertiary referral center/ 4 regional teaching hospitals)
- pre-/post-intervention study:
 - 3 months baseline measurement
 - 9 months implementation in intervention hospitals
 - 3 months post-implementation measurement
- inclusion: all adult patients undergoing general surgery

Methods

- outcome:
 - number of complications per 100 patients
 - outcome of complications
- data collection:
 - patient and surgical data from hospital administration
 - outcome data from prospective Dutch National Surgical Adverse Event Registration (LHCR)
- analysis:
 - intention to treat: post-intervention measurement includes all patients

Results

- Patient characteristics -

	Intervention			Control		
	Pre	Post	p	Pre	Post	p
No of patients	3760	3820	-	2592	2664	-
No of procedures	4364	4387	-	2924	3058	-
Length of stay (days)	9.1	8.5	0.14	7.0	7.4	0.052
Age \pm SD	57.7 \pm 17.8	56.8 \pm 18.7	0.11	58.8 \pm 17.9	59.5 \pm 17.7	0.16
Male (%)	49.3	47.4	0.09	46.6	46.8	0.93
Urgent (%)	19.5	21.2	0.09	19.9	21.2	0.24

- Complications per 100 patients -

	Intervention			Control		
	Pre	Post	p	Pre	Post	p
Respiratory	3.3	2.1	0.004	3.7	3.8	0.91
Cardiac	2.3	1.3	0.001	1.6	1.4	0.72
Abdominal	3.5	2.4	0.04	3.1	3.1	0.56
Infectious	4.8	3.3	0.006	6.8	6.3	0.22
Wound	1.5	0.8	0.008	1.0	1.2	0.56
Bleeding	2.0	0.9	0.001	2.0	2.7	0.12
Urological	2.6	1.7	0.007	3.3	2.8	0.28
Neurological	2.1	1.2	0.005	2.2	2.6	0.43
Technical	1.2	0.8	0.08	1.2	1.7	0.25
Organisational	0.9	0.4	0.007	0.4	0.3	0.77
Disturbed function	1.4	0.7	0.002	1.3	1.4	0.90
Other	1.7	1.2	0.15	3.7	3.9	0.89
Total	27.3	16.7	<0.001	30.4	31.2	0.81
	ARR 10.6 (95% CI 8.5-12.8)			ARR -0.8 (95% CI -3.2-1.7)		



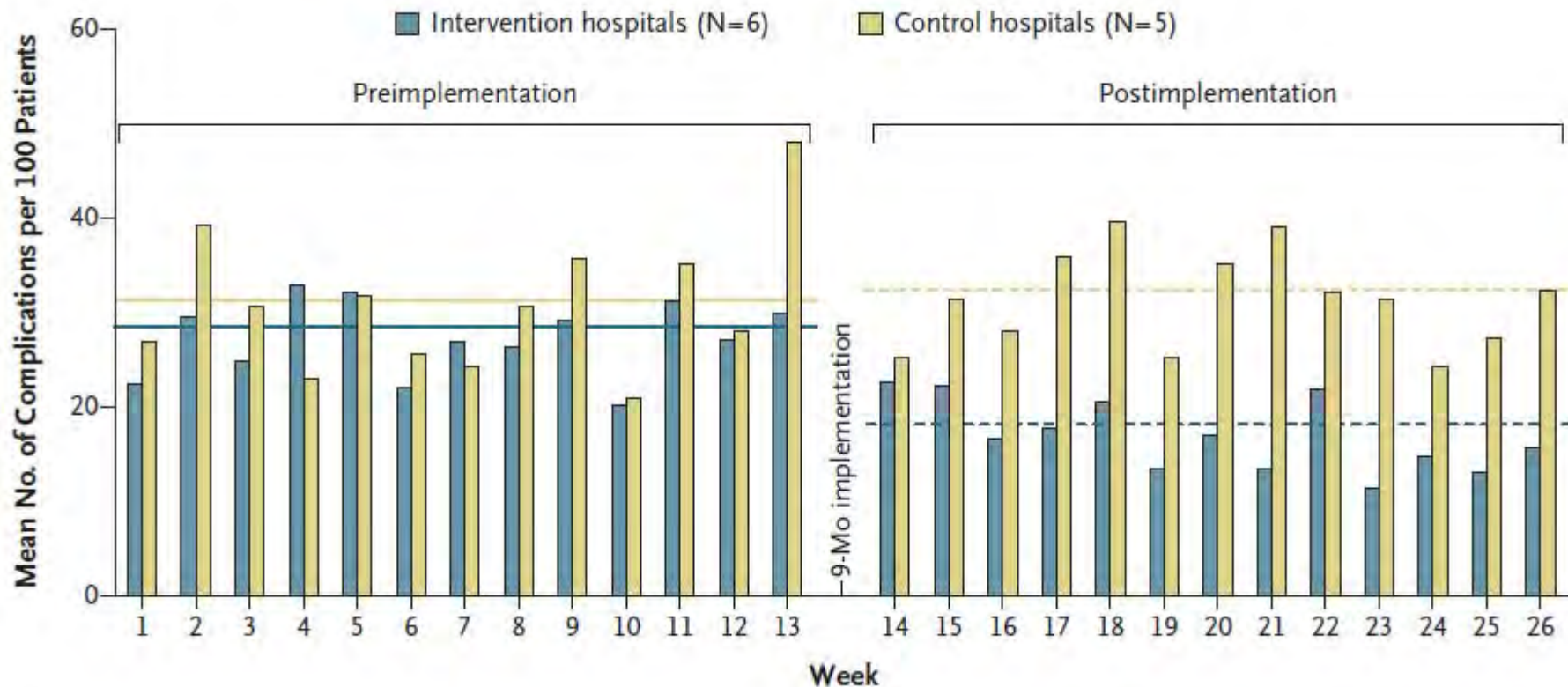
- Complications per 100 patients -

	Intervention			Control		
	Pre	Post	p	Pre	Post	p
Respiratory	3.3	2.1	0.004	3.7	3.8	0.91
Cardiac	2.3	1.3	0.001	1.6	1.4	0.72
Abdominal	3.5	2.4	0.04	3.1	3.1	0.56

Total	27.3	16.7	<0.001	30.4	31.2	0.81
ARR 10.6 (95% CI 8.5-12.8)			ARR -0.8 (95% CI -3.2-1.7)			

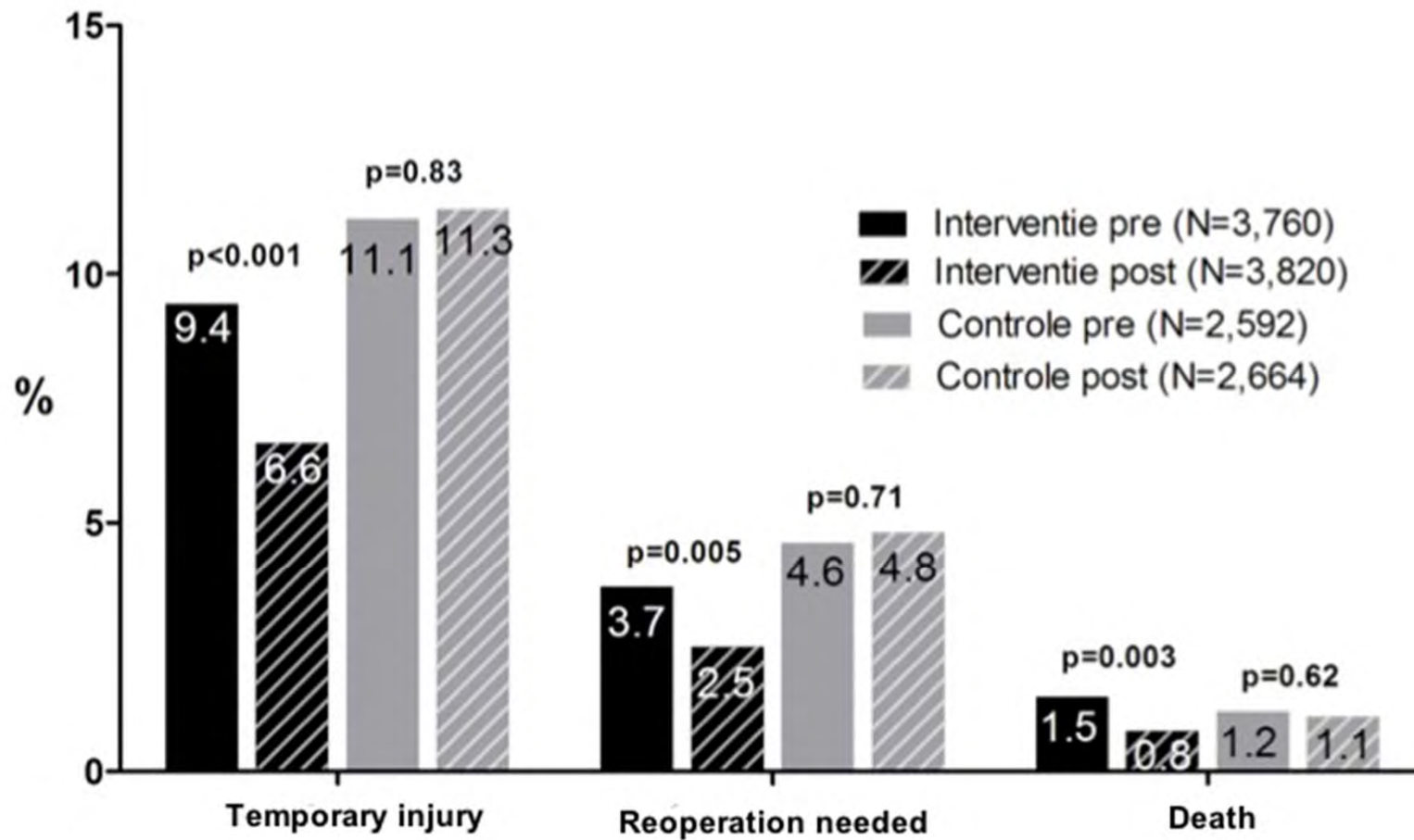
Technical	1.2	0.8	0.08	1.2	1.7	0.25
Organisational	0.9	0.4	0.007	0.4	0.3	0.77
Disturbed function	1.4	0.7	0.002	1.3	1.4	0.90
Other	1.7	1.2	0.15	3.7	3.9	0.89
Total	27.3	16.7	<0.001	30.4	31.2	0.81
	ARR 10.6 (95% CI 8.5-12.8)			ARR -0.8 (95% CI -3.2-1.7)		

Complications – Time series



Results

- Outcome of complications -



Statement 2

SURPASS checklist is too comprehensive:

a time-out procedure is more than enough
when it concerns

Observation: deviation from optimal process

- 593 incidents in 171 surgical procedures -

N=171

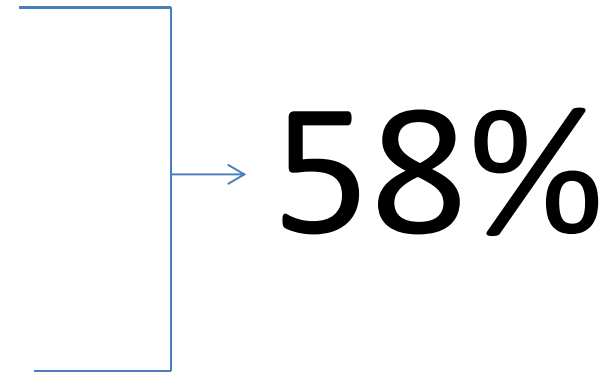
Total

593

Pre-operative 221 37%

Intra-operative 250 42%

Post-operative 122 21%



More than checking in the OR

- Patterns of communication breakdowns resulting in injury to surgical patients¹
 - 444 closed malpractice claims:
 - Preoperative **38%**
 - Intraoperative 30%
 - Postoperative **32%**

70% outside OR

¹Greenberg C.C., Regenbogen S.E., Studdert D.M., et al. J. Am. Coll. Surg. 2007

Incidents intercepted by use of SURPASS

Table 2. Intercepted incidents per part of the SURPASS checklist in 6,313 checklists (see appendix for detailed results)

Part of the checklist	Mean percentage of completion	No of intercepted incidents
Total	72.2	6,312
Total preoperative	82.5	3,458
Preoperative by operating assistant	71.3	422
Preoperative by ward doctor	81.1	578
Preoperative by surgeon	78.5	293
Preoperative by anaesthesiologist	86.5	1,010
Preoperative by ward nurse	87.8	1,144
Total peroperative	82.9	897
Time out procedure by surgeon, anaesthesiologist and operating assistant	82.9	897
Total postoperative	56.1	1,957
Postoperative by surgeon	78.6	161
Postoperative by anaesthesiologist	73.9	699
Transfer from recovery to ward by anaesthesiologist	67.7	225
Discharge by ward doctor	38.3	256
Discharge by ward nurse	45.8	616

Time-out is not enough

- 'five-to-twelve' check
- many incidents in surgical process happen outside to OR
- insufficient as stand alone procedure in high-standard clinical care

WHO's Surgical Safety Checklist



SURGICAL SAFETY CHECKLIST (FIRST EDITION)

Before induction of anaesthesia ▶▶▶▶▶▶▶▶ Before skin incision ▶▶▶▶▶▶▶▶▶▶▶▶ Before patient leaves operating room

SIGN IN

- ☐ PATIENT HAS CONFIRMED
 - IDENTITY
 - SITE
 - PROCEDURE
 - CONSENT
- ☐ SITE MARKED/NOT APPLICABLE
- ☐ ANAESTHESIA SAFETY CHECK COMPLETED
- ☐ PULSE OXIMETER ON PATIENT AND FUNCTIONING
- DOES 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 INTRAVENOUS ACCESS AND FLUIDS PLANNED

TIME OUT

- ☐ CONFIRM ALL TEAM MEMBERS HAVE INTRODUCED THEMSELVES BY NAME AND ROLE
- ☐ SURGEON, ANAESTHESIA PROFESSIONAL AND NURSE VERBALLY CONFIRM
 - PATIENT
 - SITE
 - PROCEDURE
- ANTICIPATED CRITICAL EVENTS
- ☐ SURGEON REVIEWS: WHAT ARE THE CRITICAL OR UNEXPECTED STEPS, OPERATIVE DURATION, ANTICIPATED BLOOD LOSS?
- ☐ ANAESTHESIA TEAM REVIEWS: ARE THERE ANY PATIENT-SPECIFIC CONCERNS?
- ☐ NURSING TEAM REVIEWS: HAS STERILITY (INCLUDING INDICATOR RESULTS) BEEN CONFIRMED? ARE THERE EQUIPMENT ISSUES OR ANY CONCERNS?
- HAS ANTIBIOTIC PROPHYLAXIS BEEN GIVEN WITHIN THE LAST 60 MINUTES?
 - ☐ YES
 - ☐ NOT APPLICABLE
- IS ESSENTIAL IMAGING DISPLAYED?
 - ☐ YES
 - ☐ NOT APPLICABLE

SIGN OUT

- 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

SURPASS vs WHO

	WHO	SURPASS
<i>Location</i>	Operating room	Ward, holding, operating room, recovery
<i>Timing</i>	Directly pre- and postoperatively	From (pre-)admission until discharge
<i>Involved disciplines</i>	Surgeon, anaesthesiologist, scrub nurse	Ward doctor, ward nurse, surgeon, anaesthesiologist, scrub nurse
<i>Implementation</i>	Relatively easy	Relatively difficult
<i>Range</i>	Limited	Extensive

SURPASS vs WHO

- difficult to measure contribution of different parts of SURPASS (preop, perop, postop)
 - but, **risk reduction twice as big** as time out procedure alone
- ARR mortality
 - SURPASS **0.7%**
 - WHO **0.3%** (only high-income hospitals)

Other SURPASS studies

de Vries et al. *Patient Safety in Surgery* 2010, 4:6
<http://www.pssjournal.com/content/4/1/6>



PATIENT SAFETY IN SURGERY

RESEARCH

Open Access

The SURgical PATient Safety System (SURPASS) checklist optimizes timing of antibiotic prophylaxis

Eefje N de Vries^{1,2}, Lucia Dijkstra^{1,2}, Susanne M Smorenburg², R Peter Meijer³ and Marja A Boermeester^{*1}

Better compliance with regard to timing and significant decrease of patients not receiving antibiotics until after incision

Other SURPASS studies

ORIGINAL ARTICLE

Prevention of Surgical Malpractice Claims by Use of a Surgical Safety Checklist

Eefje N. de Vries, MD, PhD‡, Manon P. Eikens-Jansen, MSc†, Alice M. Hamersma, MSc†, Susanne M. Smorenburg, MD, PhD‡, Dirk J. Gouma, MD, PhD*, and Marja A. Boermeester, MD, PhD**

Annals of Surgery • Volume 253, Number 3, March 2011

Theoretical prevention of 40% of deaths and 29% of incidents leading to permanent damage

Other disciplines: RADPASS

Cardiovasc Intervent Radiol

DOI 10.1007/s00270-012-0395-z

CLINICAL INVESTIGATION

A Checklist to Improve Patient Safety in Interventional Radiology

Inge C. J. Koetser • Eefje N. de Vries •
Otto M. van Delden • Susanne M. Smorenburg •
Marja A. Boormeester • Krijn P. van Lienden

RADPASS®
Radiological Patient Safety System

Amsterdam
Intervention
Centre

© RADPASS checklist
Version 1.0 (2012)
Amsterdam Interventional Centre

Date: _____

Procedure: _____

First procedure on this patient: Elective () Acute ()

Subsequent procedure: Elective () Acute ()

Patient data: _____

A. Planning and Preparation

	Yes	No*	N.a.
• Registration form present	()	()	()
• Prior history known	()	()	()
• Indication for procedure clear	()	()	()
• Relevant imaging studies present	()	()	()
• Patient under general anesthesia: preparations executed	()	()	()
• Hospital admission arranged	()	()	()
• Contra-indications identified for patient consent	()	()	()
• Contra-indications checked for patient consent	()	()	()
• Preparations for renal failure executed	()	()	()
• Lab results: Amphotericin ... all	()	()	()
• Coagulation: Thrombocytes ... aPTT ... PT ... INR ... Aa	()	()	()
• Medication for procedure ordered in stock	()	()	()
• Equipment present (catheter/catheters etc.)	()	()	()

*Comment: _____

B1. Before procedure

	Yes	No*	N.a.
• Right patient/right procedure	()	()	()
• Right side/right side	()	()	()
• Procedure explained to patient (parents)	()	()	()
• Possible complications discussed with patient (parents)	()	()	()
• Antibiotics administered	()	()	()
• IV access present	()	()	()

B2. After procedure

	Yes	No*	N.a.
• Post-procedural care form written	()	()	()
• Images sent to electronic picture archiving system	()	()	()
• Image sample labeled and sent off	()	()	()
• Follow-up appointment made	()	()	()
• Procedure and result explained to patient (parents)	()	()	()
• Patients' results discussed with referring physician	()	()	()
• Report dictated in electronic communication system	()	()	()
• Billing code processed	()	()	()

*Comment: _____

None indicated

Date: _____

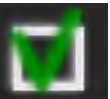
Reason: _____

Consent with: _____

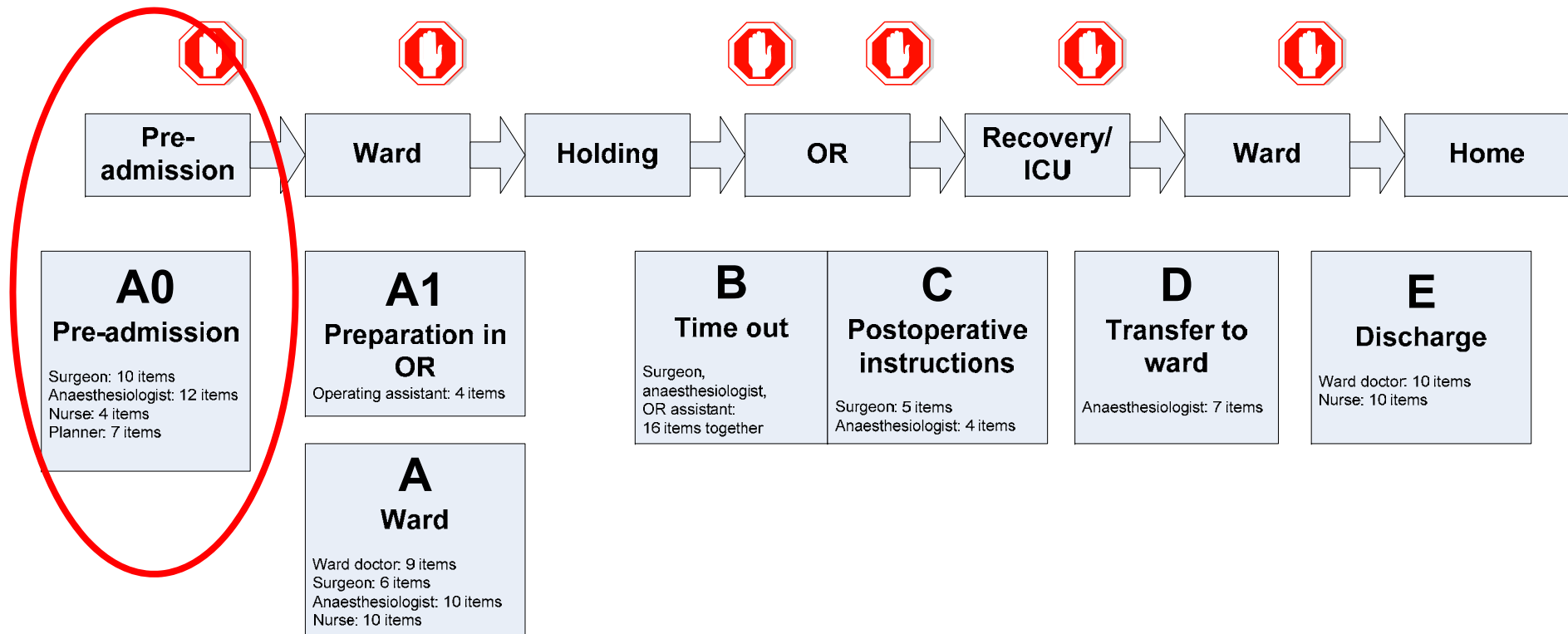
Date: _____

None radiologist

Date: _____



SURgical PATient Safety System 2011 (SURPASS)




Conclusions

- our patients are not as safe as we would like them to be
- checklists provide a blueprint of the ideal situation and decrease reliance on human memory.
- there is more to it than checking in the OR
- SURPASS covers the entire surgical pathway
- associated with 40% decrease in complications, 50% decrease in mortality
- SURPASS Digital from all work stations

SURPASS Digital

www.surpass-checklist.nl



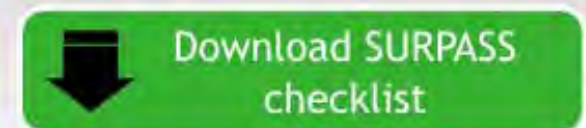
SURPASS

SURgical Patient Safety System

[Nederlands](#) | [English](#)

[Home](#)
[SURPASS](#)
[SURPASS digital](#)
[Contact](#)

		SURPASS	SURPASS Digital
1	<u>Prevents adversed errors.</u>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
2	<u>Using a validated and effective checklist</u>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
3	<u>Offers tooling for implementing safety guidelines</u>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
4	<u>Interoperable with most Health Information Systems(HIS) and Patient Data Management System(PDMS)</u>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
5	<u>Track-and-trace system for patient checks during the operative process.</u>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
6	<u>Up to date status of the checklist is available any time, anywhere</u>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
7	<u>Easy archiving and analysis of completed checklists</u>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
8	<u>Implementation support</u>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
9	<u>Available for all hospitals</u>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>




SURPASS in the news


Surgical checklists might cut malpractice claims
Surgical checklists not only save lives by preventing medical errors, they could also make a big dent in medical malpractice claims, Dutch researchers say.

[News overview](#)

SURPASS keypaper in de New England Journal of Medicine


[Effect of a Comprehensive Surgical Safety System on Patient Outcomes](#)

SURPASS checklist wins National Safety award 2011!



The SURPASS checklist which has been developed by (amongst others) surgeon