

SICOT/SIROT XXIV Triennial World Congress 2008
Plenary speaker, 27 August 2008, Hong Kong

SICOT 2008
PHE

Clinical and Health Economic Relevance of The Swedish Hip Arthroplasty Register

P. Herberts MD, PhD.
Professor



Department of Orthopaedics
Sahlgrenska University Hospital,
Göteborg, Sweden



Acknowledgment to co-workers

Johan Kärrholm
Göran Garellick

&

The entire Register Staff

The idea of a national Register

Serious consideration should be given to establishing a central register to keep a finger on the pulse of total implant surgery on a nation-wide basis



*Sir John Charnley
Internal Publication No 39, 1972*

The Swedish Hip Arthroplasty Register- A Prospective Observational Study

- Started 1979 and has had a profound impact on the results of all THR surgery in Sweden.
- Owned by the Swedish Orthopaedic Society
- Supported by the National Board of Health and Welfare.

The Swedish Register

Internet address

- <http://www.jru.orthop.gu.se/>
- All data collection and feedback through this site since Jan. 1st 1999.

The Mission

- To improve the general outcome of total hip replacement by outcome assessment
- To establish a continuous learning process
- To control quality with focus on the procedure – i.e. enables cost-utility analysis
- To give public information of results

Confidential and public feedback on-line and Annual Reports

Feedback of results is the most essential
feature for compliance and will make
continued clinical responsibility
and accountability feasible

www.jru.orthop.gu.se

The Swedish THA Register 1979 - 2007

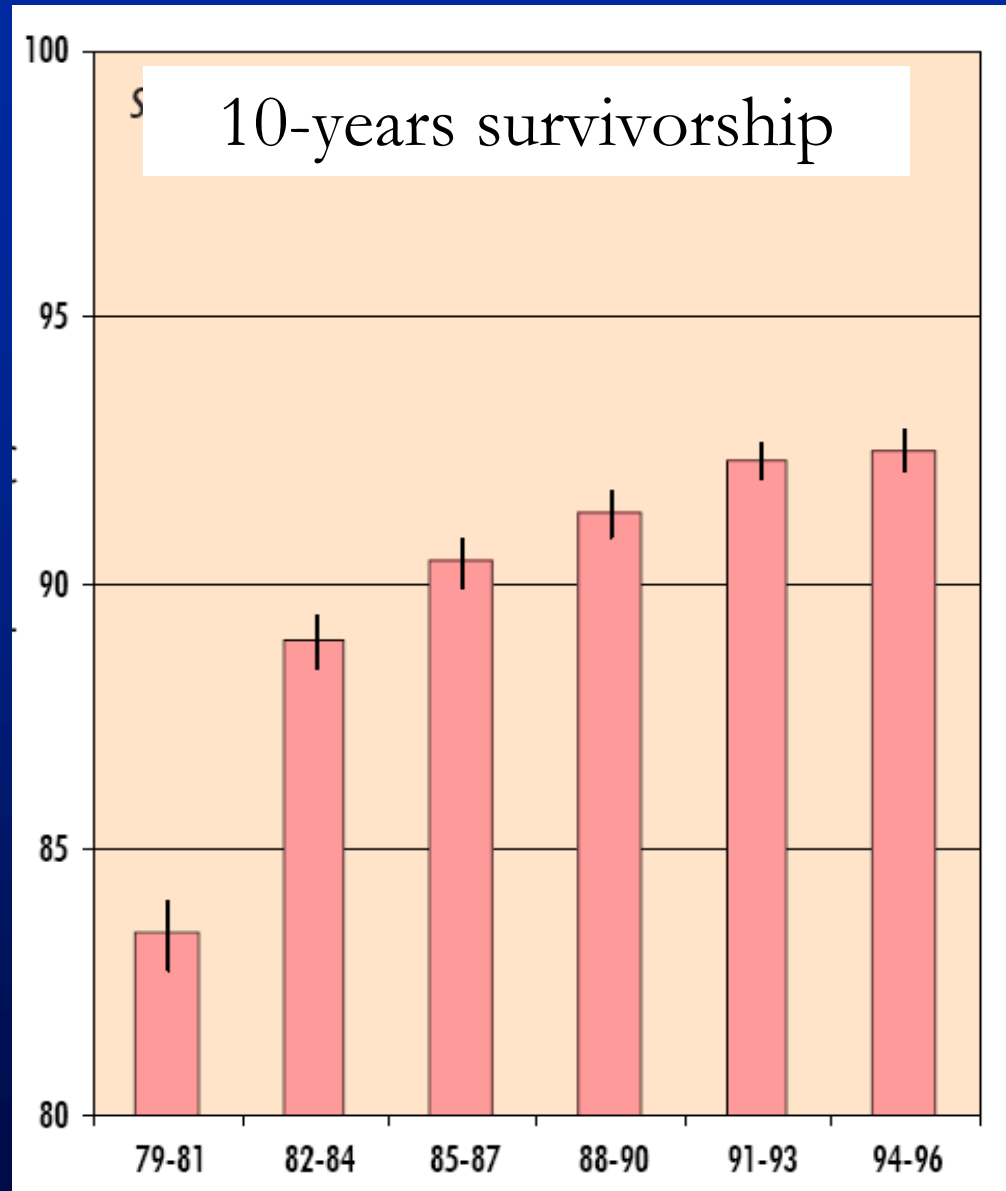
- 284,630 primary THR
- 27,690 revision THR

Two levels of Definition for Failure

- Traditional:
Revision of the implant (since 1979)
- The patient not satisfied or low HRQoL at follow-up (2002)

Results after 30 years

The result of this continuous outcome assessment and dissemination of results back to the profession is a constant improvement of the 10-year survivorship on a nation-wide basis



% survivors

10-year: 94%

time interval – index operation

Restriction of Implant Choice

One reason for improvement

- Survival statistics based on patient-and implant related factors.
- Kaplan-Meier and regression analysis.
- In 2007 more than 50% of the THRs were done with 3 cemented implant combinations.

Primary THR in Sweden 1979 - 2007

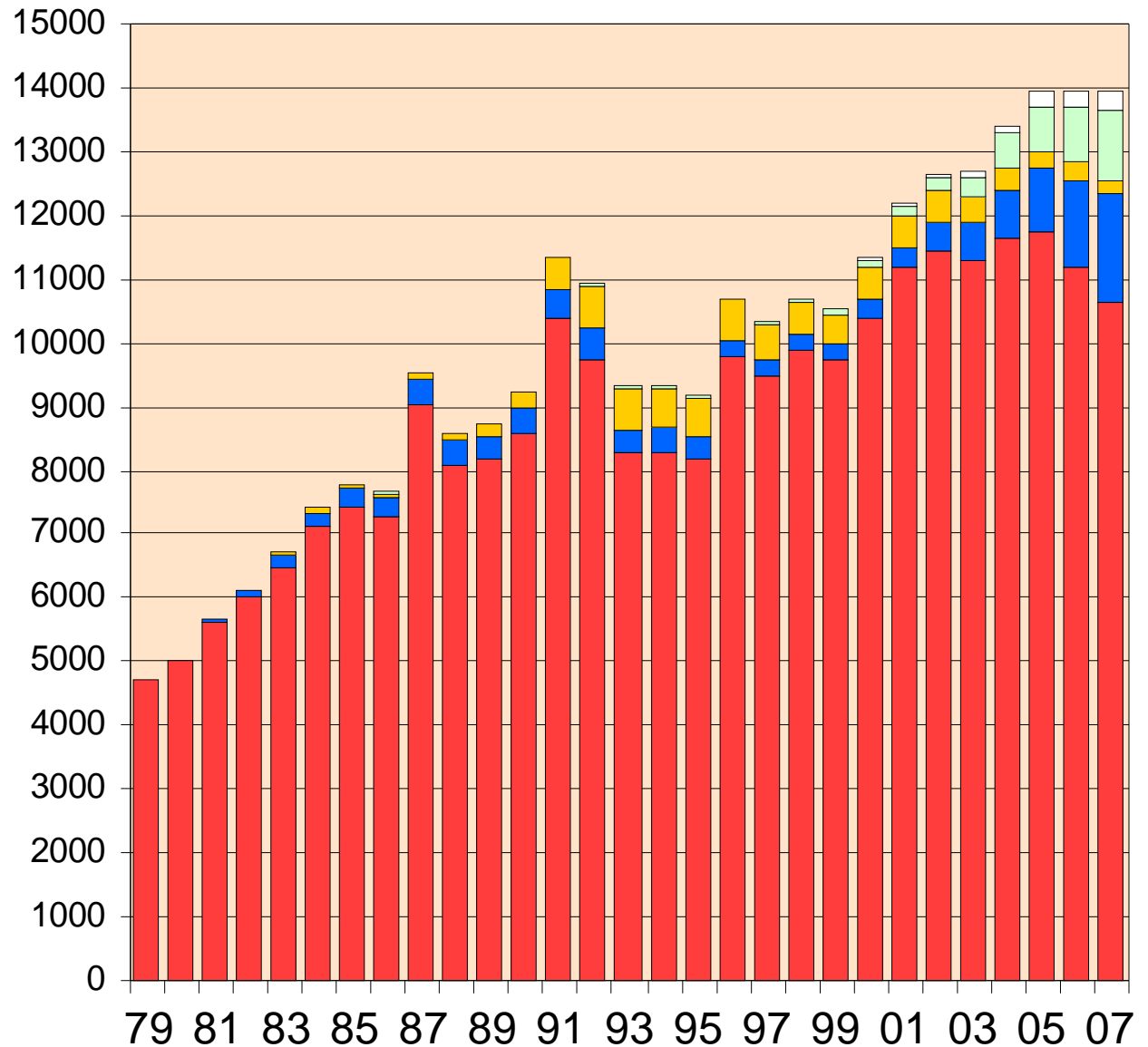
Cemented

Hybrid

Uncemented

Reversed hybrid

Resurfacing

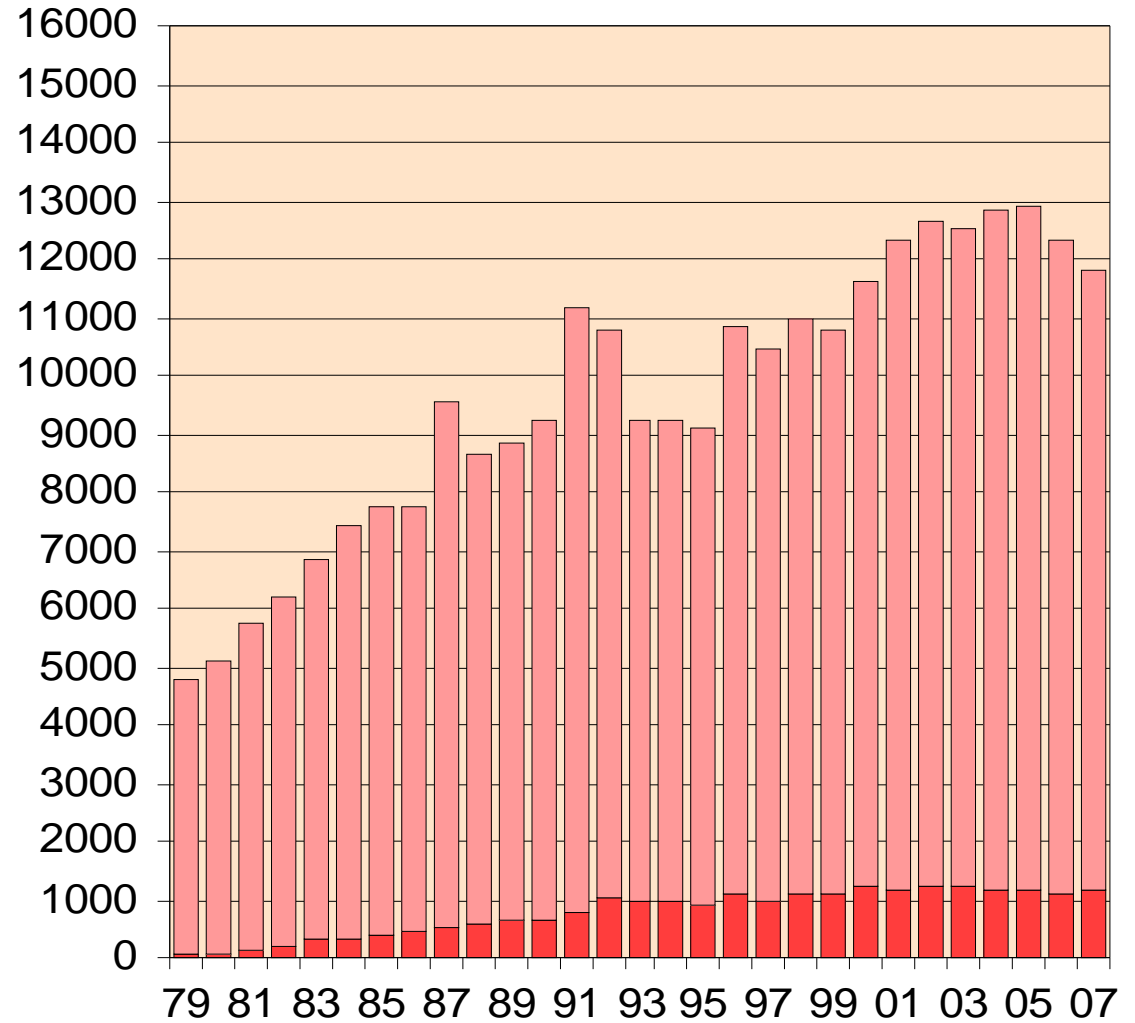


All cemented THRs

256 689 primary THRs, 22 641
revisions, 1979-2007

RB 1979 – 2007: 8.1%

RB 1992 – 2007: 9.8%

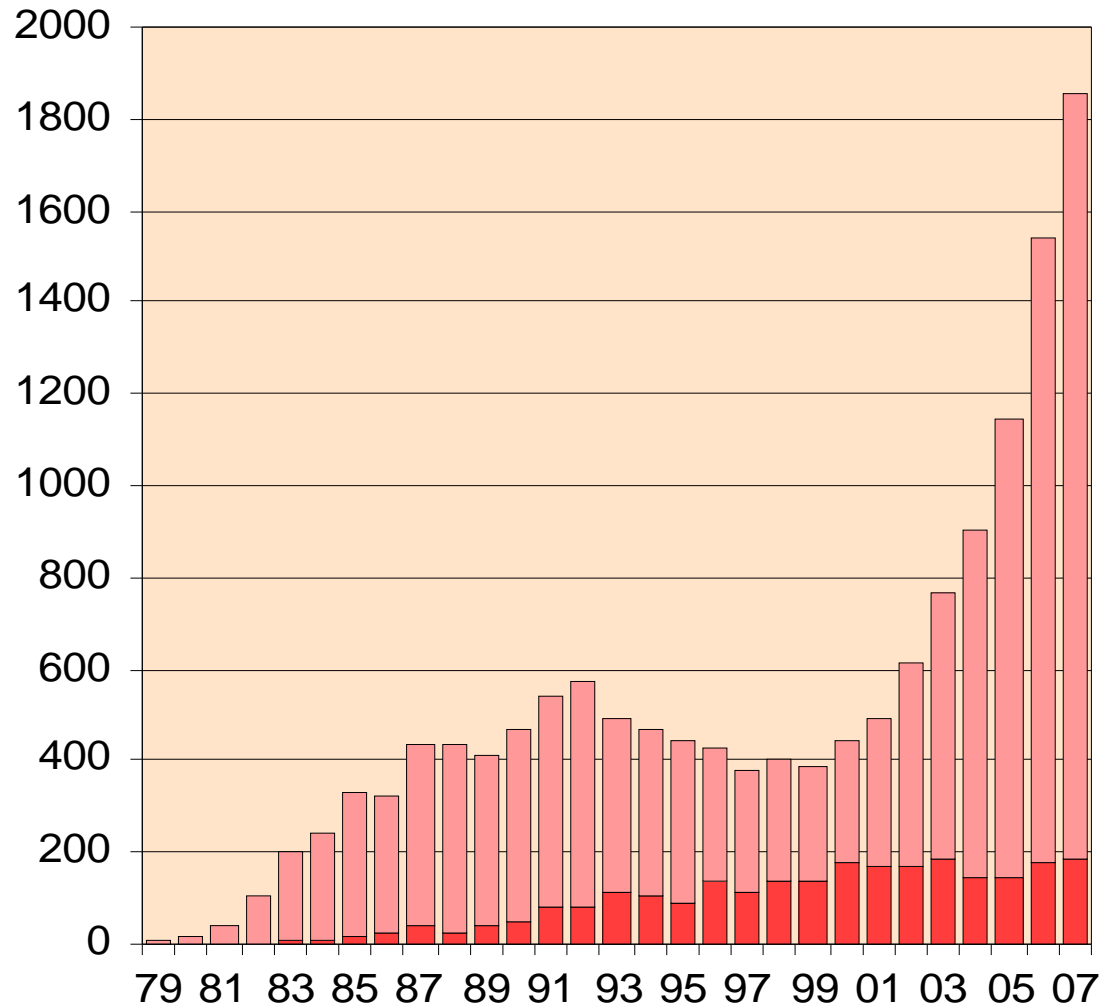


Uncemented THRs

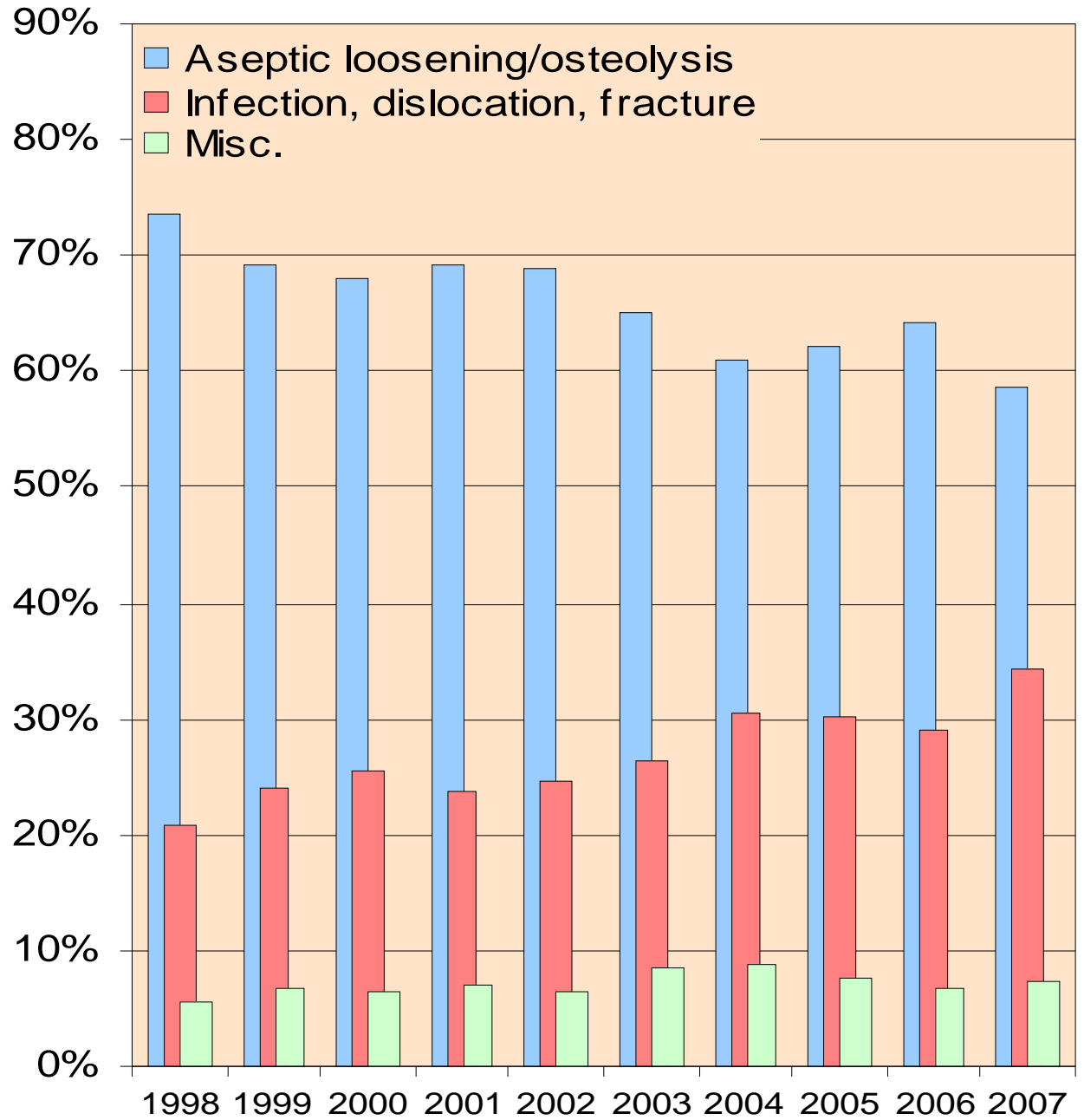
12 289 primary THRs, 2 569 revisions,
1979-2007

RB 1979 – 2007: 17.3%

RB 1992 – 2007: 20.3%



Reasons for revision 1998 - 2007



Improvement of surgical technique

Most important reason for improvement

Significant factors in regression analysis

Pulsative lavage

Distal femoral plug

Proximal femoral seal

Vacuum mixing

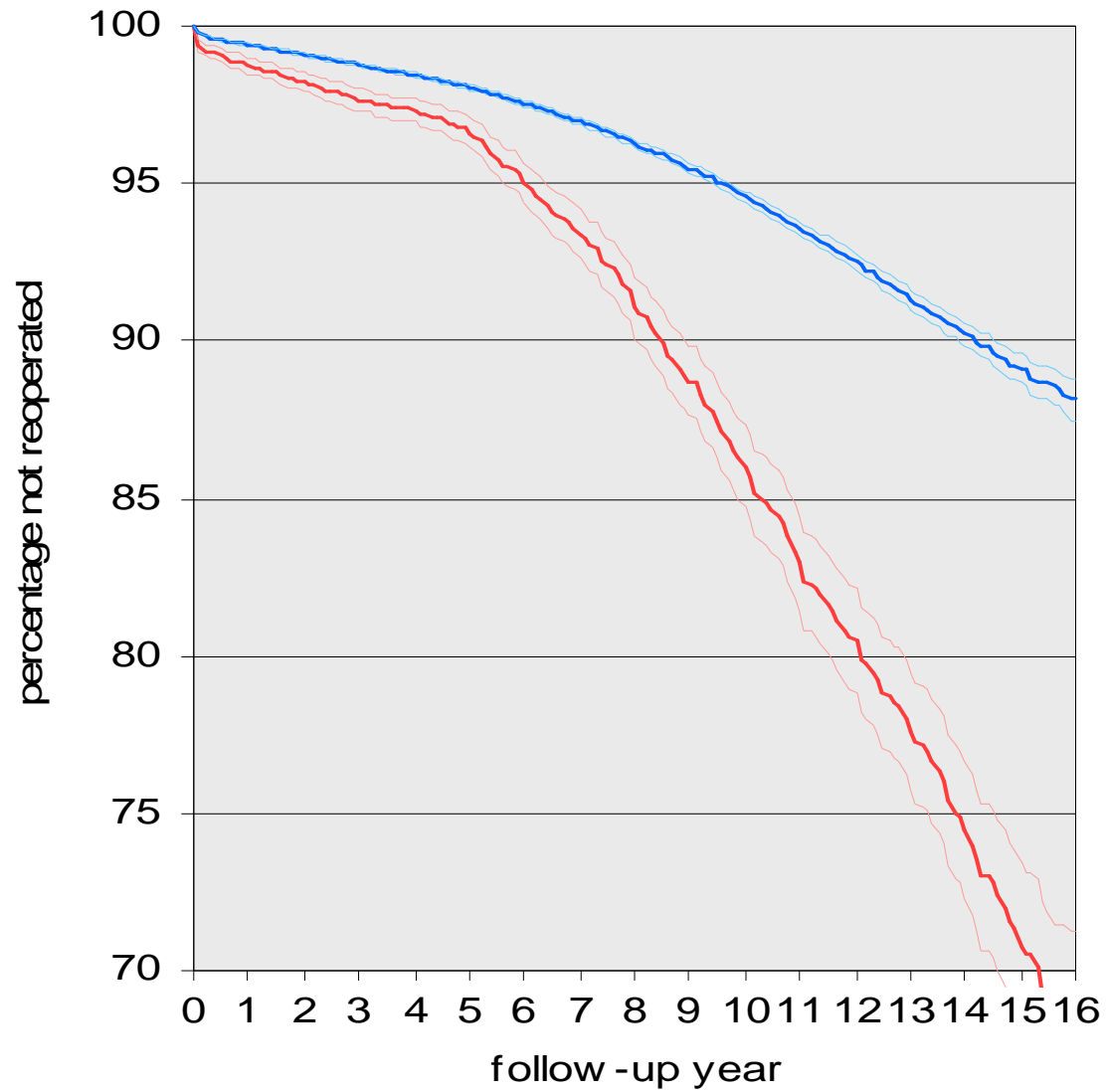
Cementing technique

OA and aseptic loosening

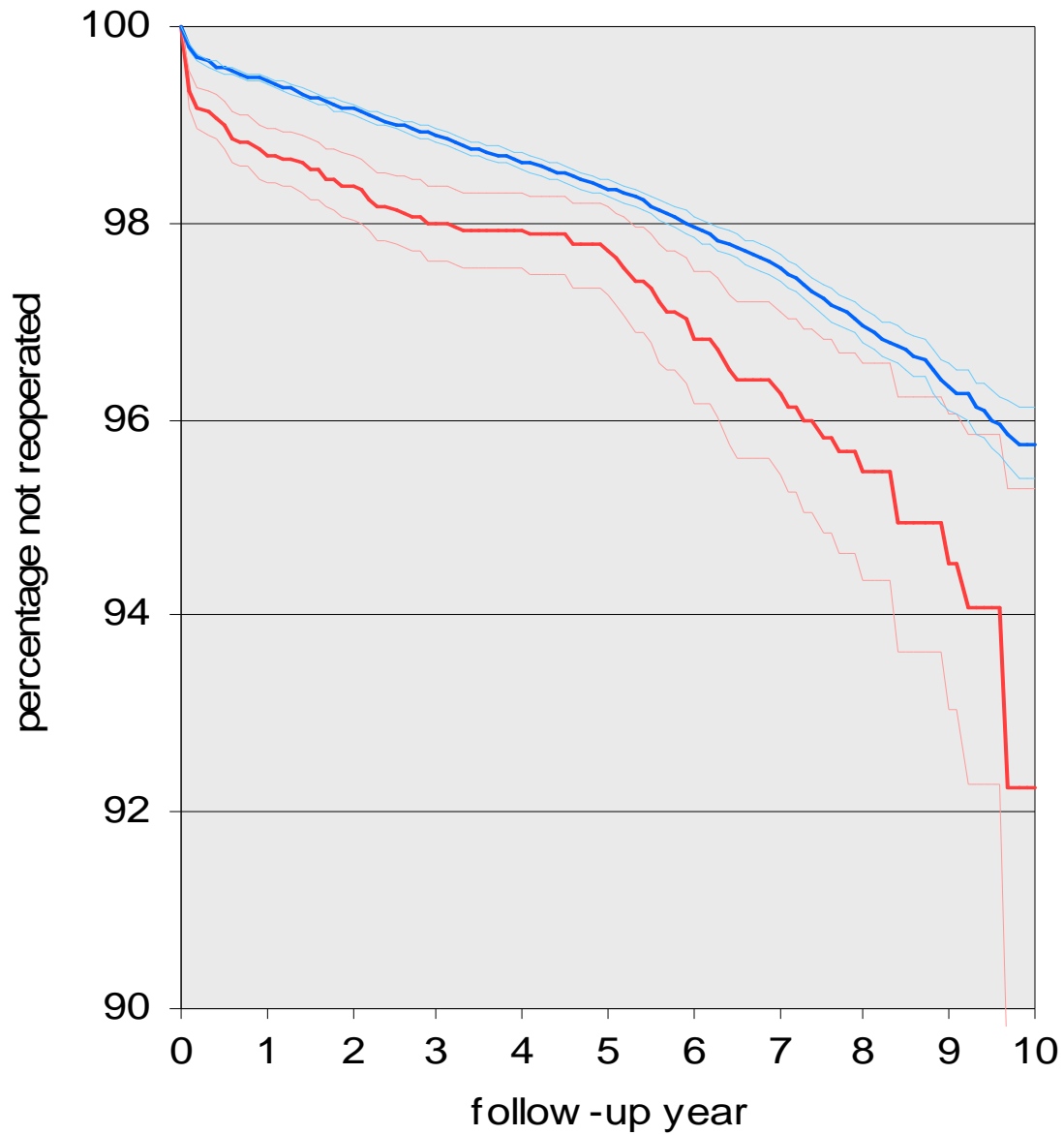
	<i>Risk ratio</i>	<i>95% confidence limits</i>
Pulsatile lavage	0.72	0.66-0.79
Proximal femur seal	0.79	0.72-0.87
Distal femoral plug	0.87	0.80-0.94

Introduction of new technology i.e. uncemented fixation

The problem is that surgeons by their nature are attracted to new ideas and concepts. New designs are used with very little supporting evidence

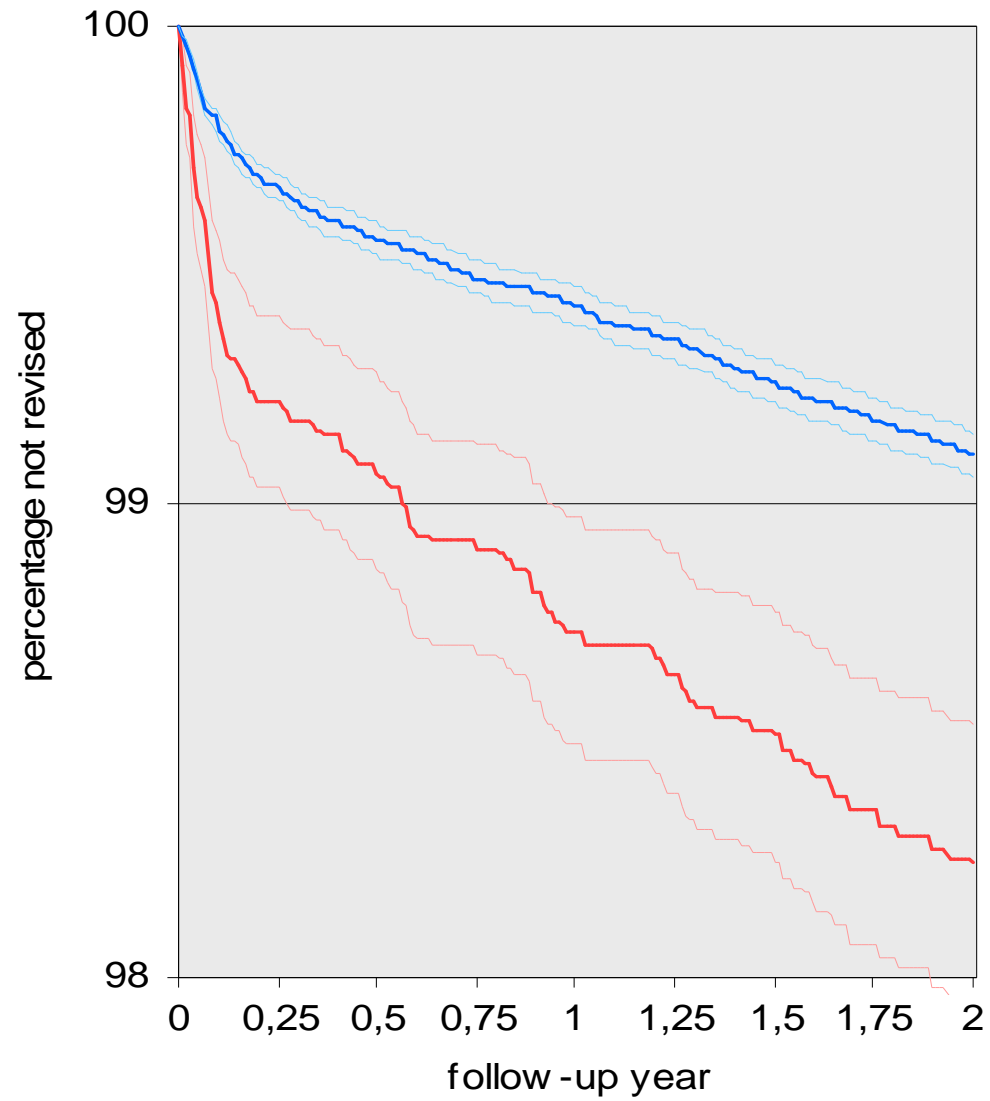


Survival cemented fixation in blue
Survival uncemented fixation in red
(n=170.413 1992-2007)

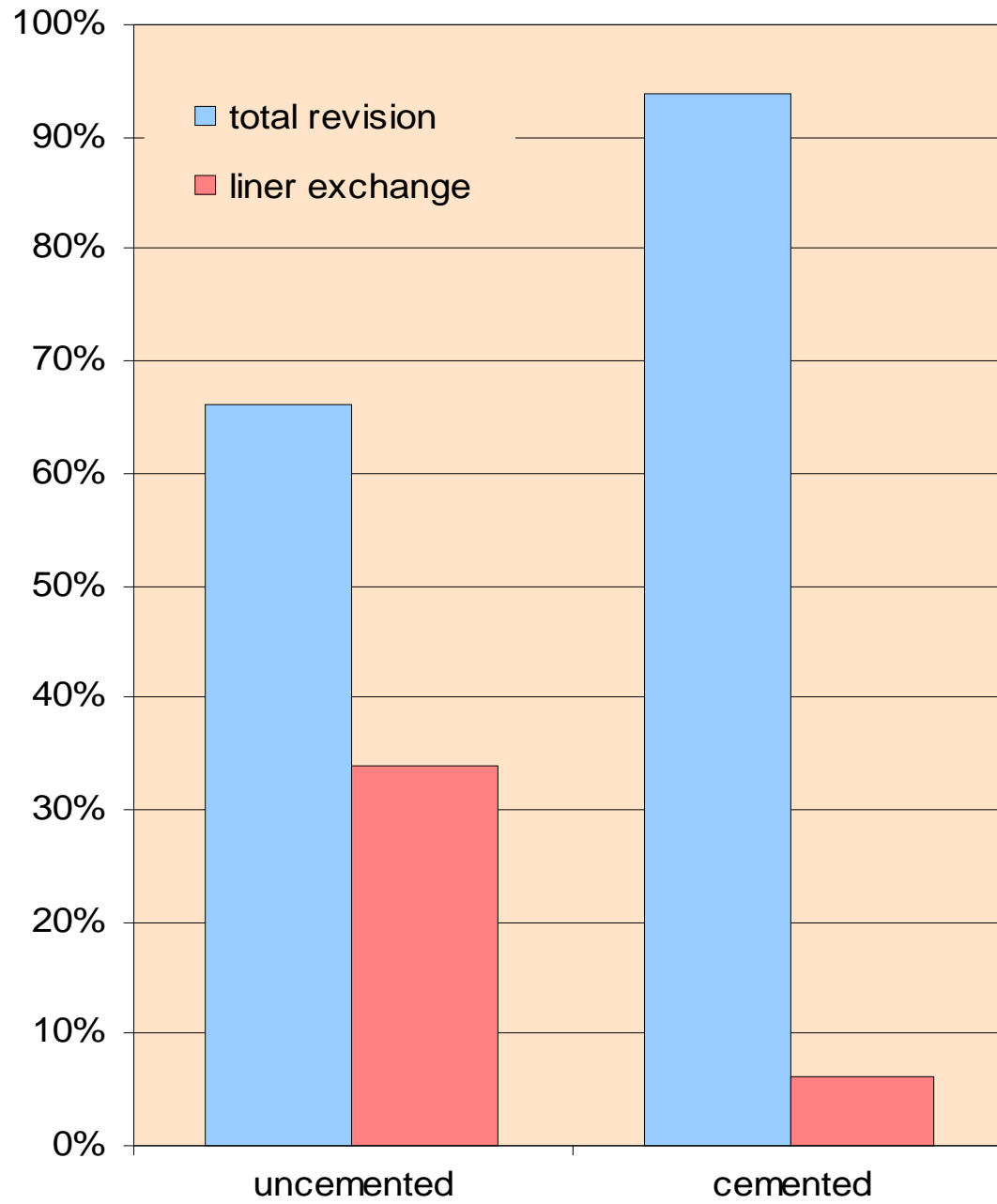


Survival cemented fixation in blue

Survival uncemented fixation in red (n=115.959, 1998-2007)

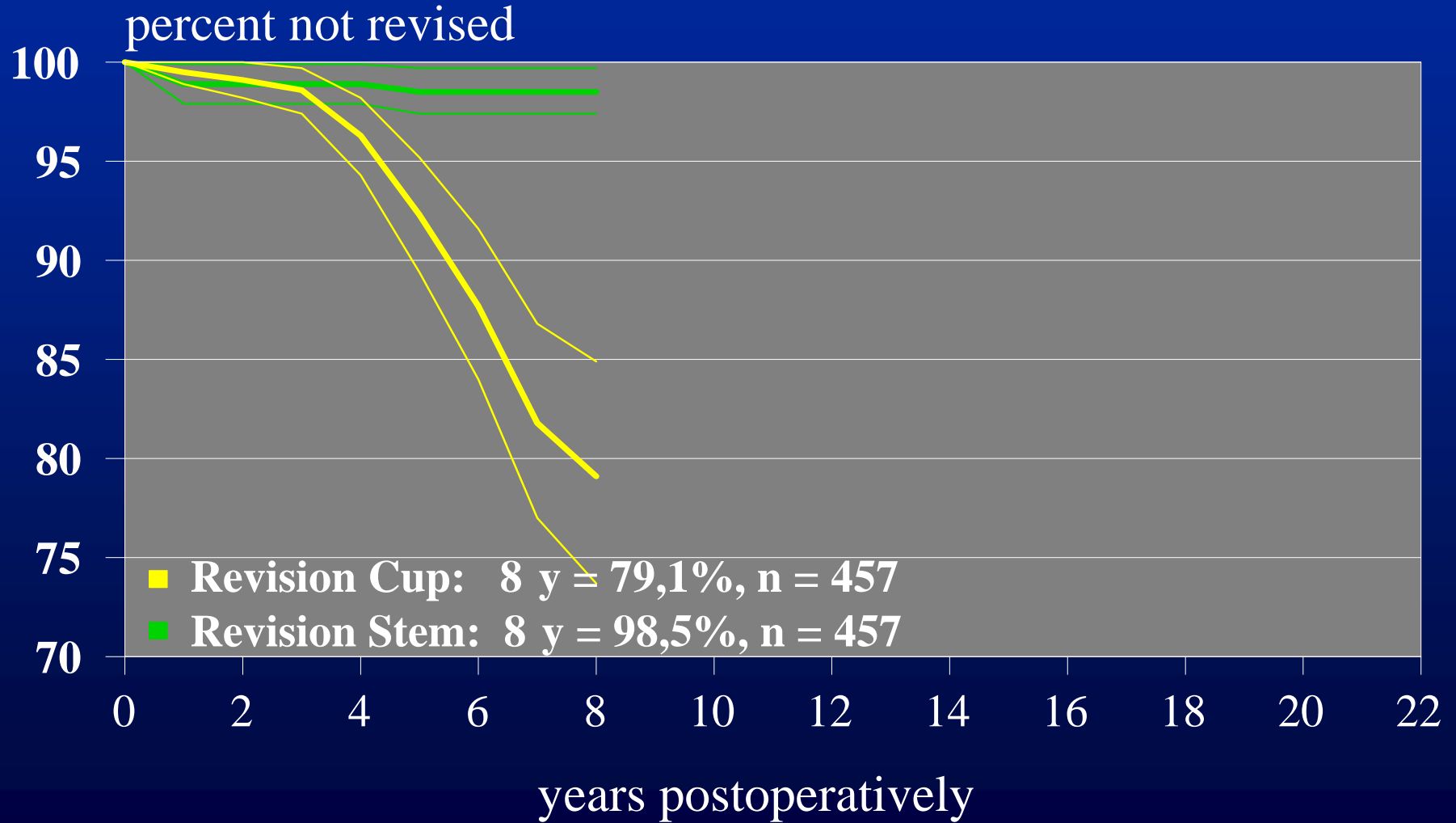


Survival cemented fixation in blue
Survival uncemented fixation in red
Revised within 2 years (1998-2007)



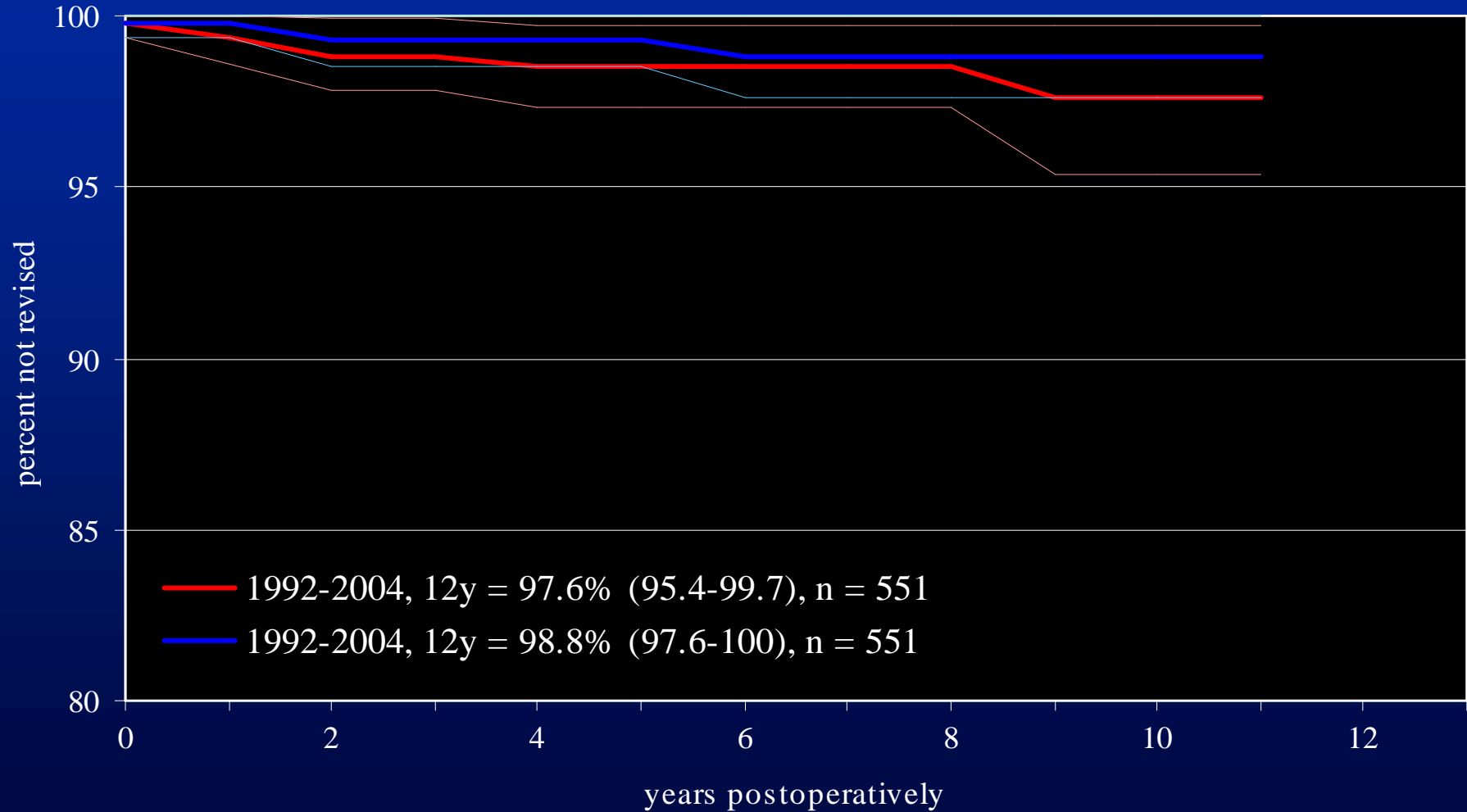
Secur-Fit/Omnifit

All observations, 1979-2000



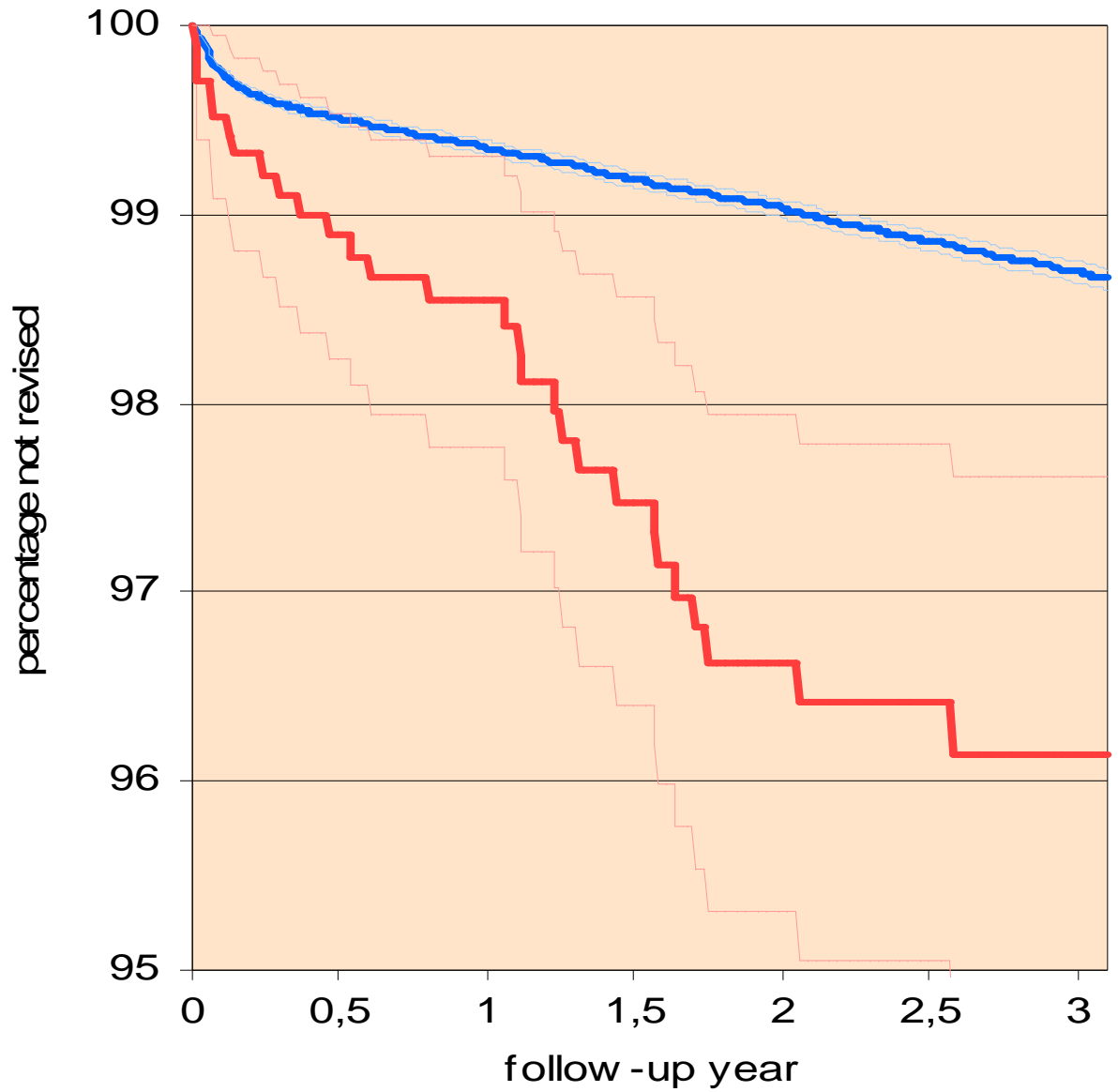
CLS Spotorno

all diagnoses and all reasons



**All other fixation
methods**

Resurfacing



NARA

Nordic Arthroplasty Register Association



NARA history:

- Danish Hip Arthroplasty Register 1995
- Norwegian Arthroplasty Register 1987
- Swedish Hip Arthroplasty Register 1979

Material:

- A total of 280 201 THR:s
- Denmark 69 242
- Sweden 140 821
- Norway 70 138

Results 10-year survival:

9 596/280 201 revised

- Denmark 91.9% (91.5-92.3)
- Sweden 93.9% (93.6-94.1)
- Norway 92.6% (92.3-93.0)

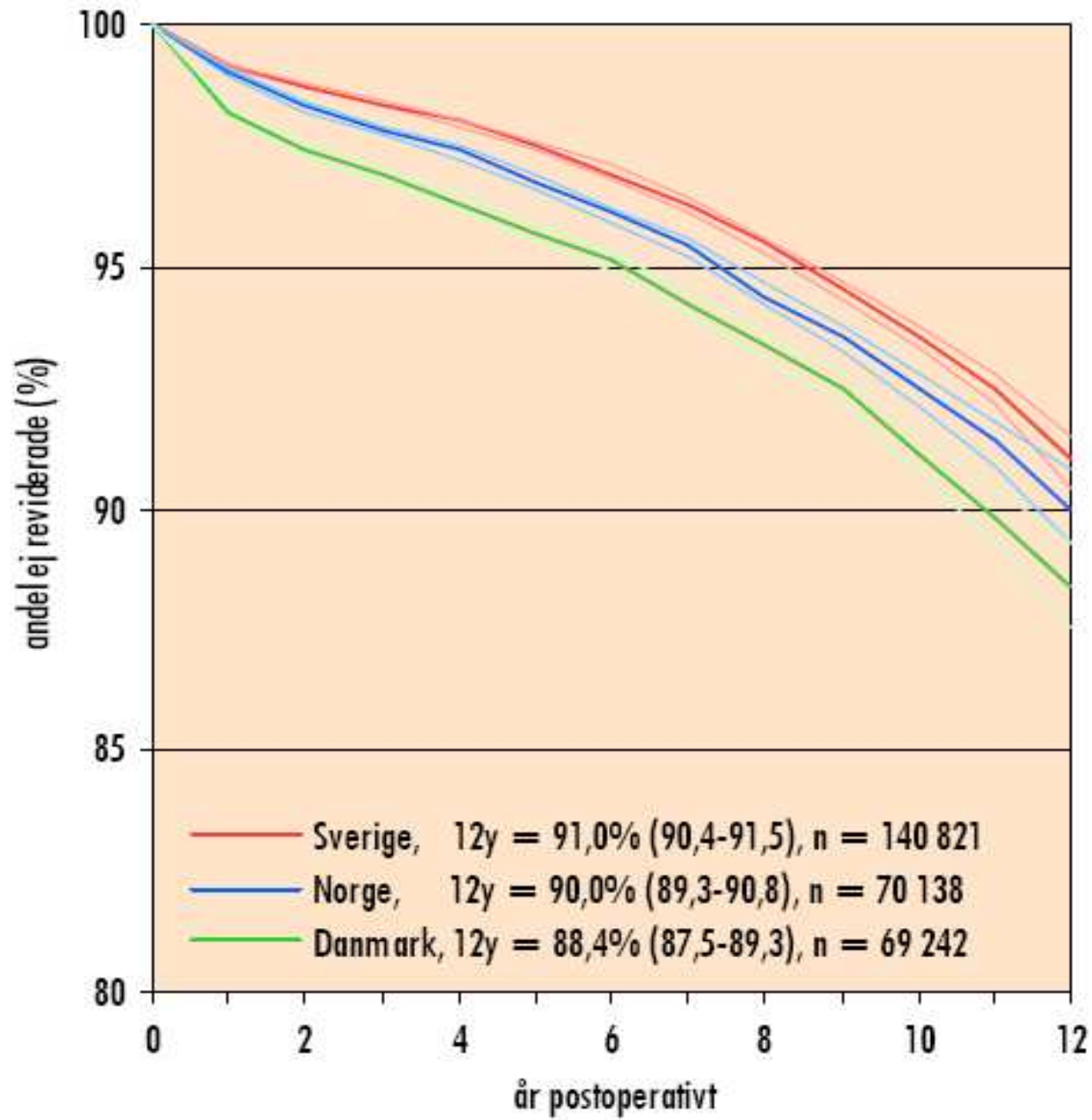
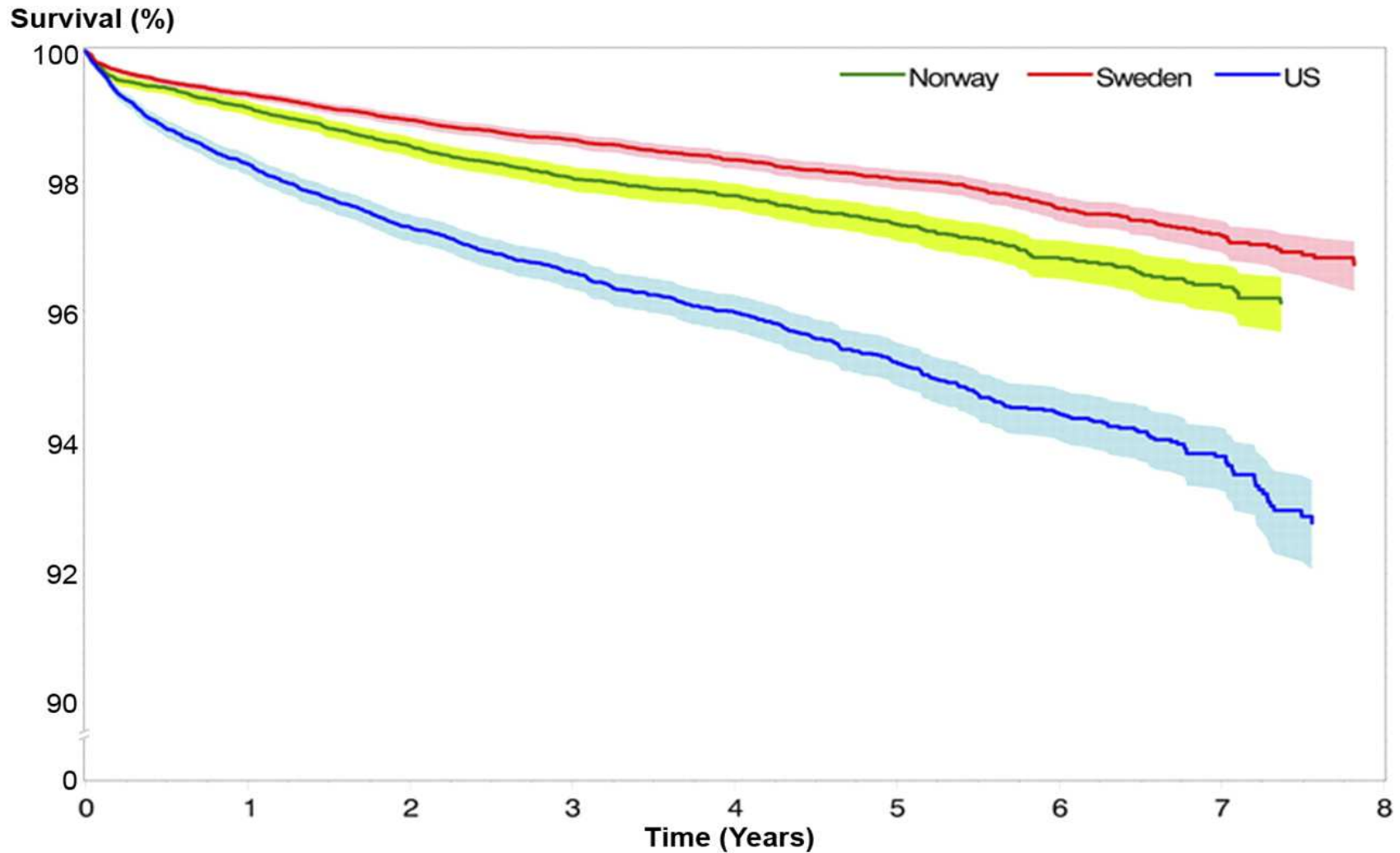


Fig. 4 Survivorship curves (with 95% confidence intervals) for total hip arthroplasty implants in the United States, Sweden, and Norway.



Kurtz S. M. et.al. J Bone Joint Surg 2007;89:144-151

Effect of Arthroplasty Registries

- The argument that information from a Registry is not as good as a well designed research study does not exist. They are different things.
- The fact that Registries are more effective at improving clinical outcomes than research studies is clearly established.

Register improvement since 2002

Increase the sensitivity for failure definition

- Since 6 years we capture PROM by use of EQ-5D – HRQoL, pain and satisfaction
- Web based registration and feed-back.
- It will enable a large scale of cost-utility studies.

The PROM instrument (patient related outcome measurement)

- Charnley classification (A, B, C)
- Pain – VAS (0-100)
- EQ-5D – HRQoL

- Satisfaction – VAS (0-100)

EQ-5D

- Self-reported health related QoL
- Five dimensions
- EQ-5D index from 0-1

The project implies Follow up for all primary THRs in Sweden

- Preop: questionnaire (10)
- 1 year: questionnaire (11)
- 6 years: questionnaire + X-ray
- 10 years: questionnaire + X-ray



Höftdispensär

Pilotprojekt inom Nationalregistret för höftledsplastiker i Sverige.

SU/Sahlgrenska

START

DOCUMENTS

LINKS

HIPFACT

FEEDBACK

ABOUT US

content
questions:
Kaisa Erikson

technical
questions:
Ramin Namitabar

Registrering av patient

Personnummer: Sida: Tillfälle:
480301-5215 Höger Preoperativt

Kliniskt protokoll:

Via formulär **Via pekskärm**

Röntgenprotokoll:

Via formulär

Rapporter och resultat

[En sammanställning av klinikens utfall i jämförelse med hela landet](#)

[Hämta klinikens data i Excel-format \(version 4.0\)](#)

[Totalt antal registreringar per klinik](#)

[Antal registreringar per klinik 2005](#)

[Antal registreringar per klinik 2004](#)

[Antal registreringar per klinik 2003](#)

[Antal registreringar per klinik 2002](#)



Copyright © 2004 Joint Replacement Unit. All rights reserved. Page last revised at 2005-0

DESIGNED &
PROGRAMMED
BY



Har Du besvär från andra höften?



Ja



Nej

paperless – time saving

methodologically attractive

the patient is “forced” to answer all questions in order to go further

no missing values!



backa

The outcome results-Specific gains for the clinic

- Every clinic can log in on-line
- Own results versus the country
- Pre and postop values for EQ-5D
- Pre and postop values for pain, satisfaction and Charnley category

Höftdispensär

En sammanställning av klinikens utfall i jämförelse med hela landet.

Dessa resultat bygger på vad som fanns i databasen 2008-08-07 och innefattar registreringar från 74 kliniker.

Variabel	Din klinik			Hela landet		
	Preoperativt	1-Årsuppfölj.	Skillnad	Preoperativt	1-Årsuppfölj.	Skillnad
Antal registreringar	738	902		34 712	26 956	
Tillfredsställelse (VAS)		20			18	
Smärta (VAS)	61	17	44	61	15	46
EQ-5D Index	0,35	0,69	0,35	0,40	0,76	0,36

EQ-5D index comparable with an aged and gender matched population (0.76 – 16 000 inhabitants)

Register gains with a standardized follow-up routine

- Patient reported outcome is present
- Increased sensitivity with a complementary failure definition.
- Decreased number of “unrecorded” failures.

Furthermore

- Since 2 years the National Board of Health and Welfare in Sweden desires inclusion of patient reported outcome in all Quality Registers
- ...and “faster” performance indicators

Four outcome dimensions in the Register

- Patient related parameters:
pain *satisfaction* *QoL*
- **Reoperation @ 2 years**
- Revisions @ 5 and 10 years
- Cost-effectiveness analysis

Re-op @ 2 year: dislocation/ deep infection

- high patient morbidity
- technically demanding
- very expensive
- high failure rates
- often bad patient related outcome



Open variables from the Register per hospital on the home page:

- 5-year implant survival
 - 10-year survival
-
- reoperation @ 2 year
 - satisfaction
 - pain relief
- EQ-5D gain @ 1, (6 and 10 year)
 - 90-days mortality
-
- cost

The Clinical Value Compass

Patient Satisfaction

Clinical
Outcome



Functional
Health
QoL

Cost and Utility

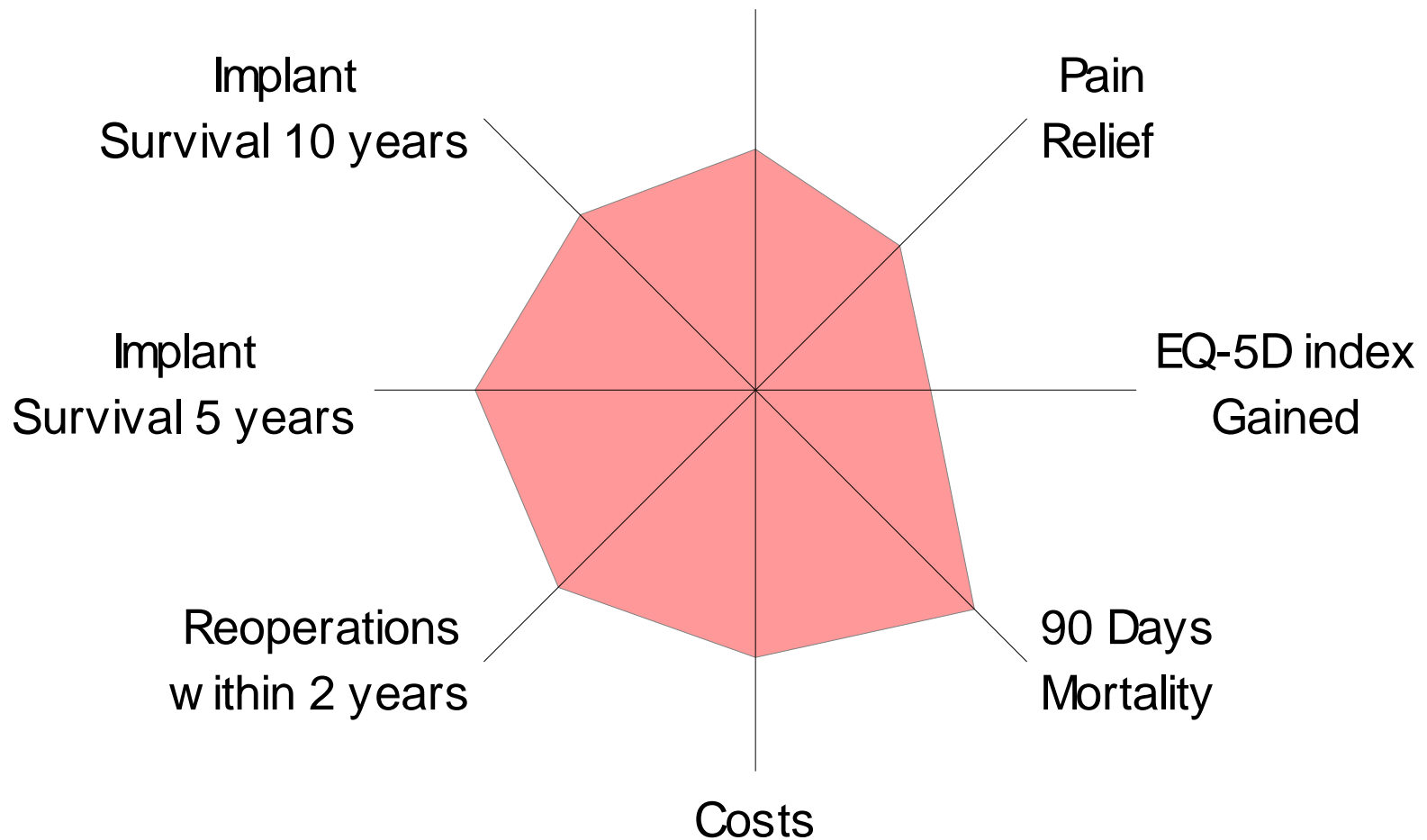
Batalden and Nelson,
Dartmouth Medical School.

Clinical Value Compass

THA surgery in Sweden - range of mean values

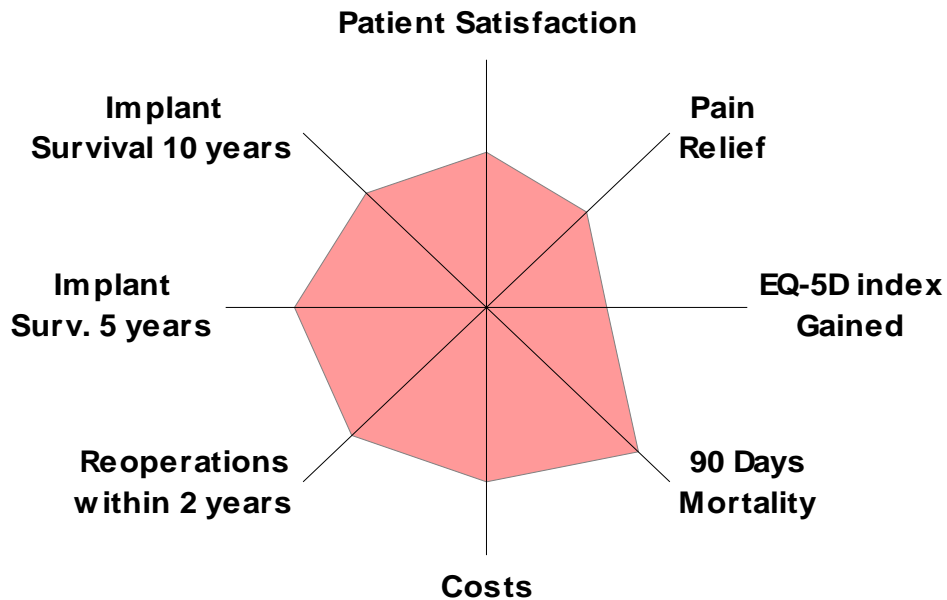
($\pm 1SD$)

Patient Satisfaction



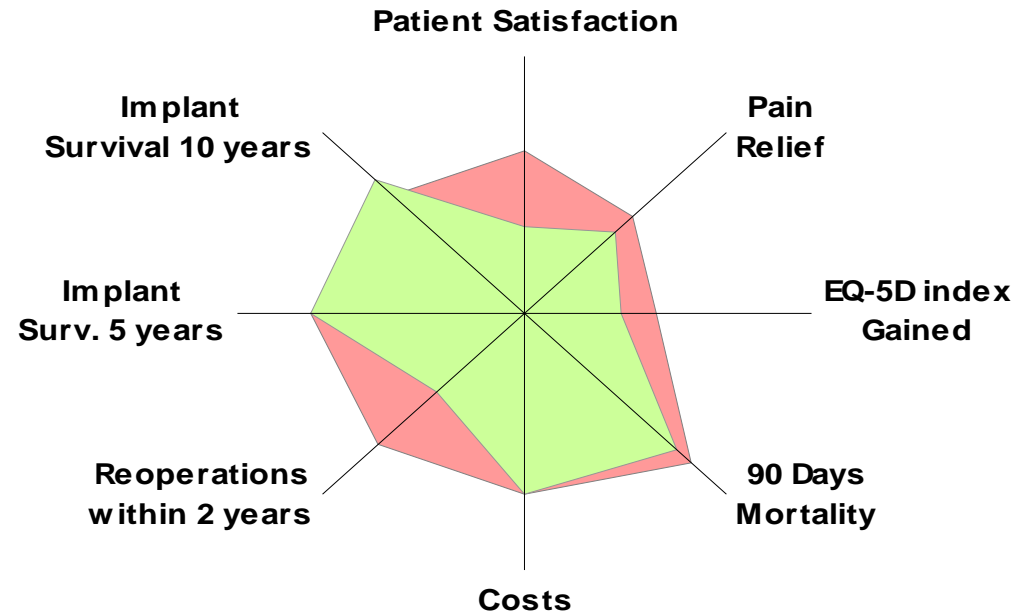
Clinical Value Compass

THA surgery in Sweden



Clinical Value Compass

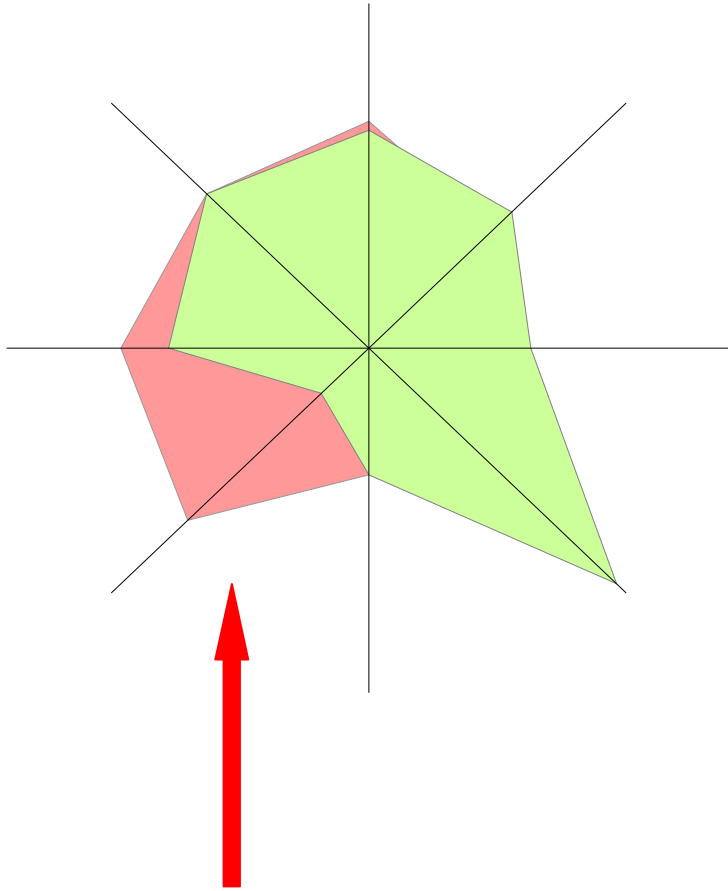
Hospital A



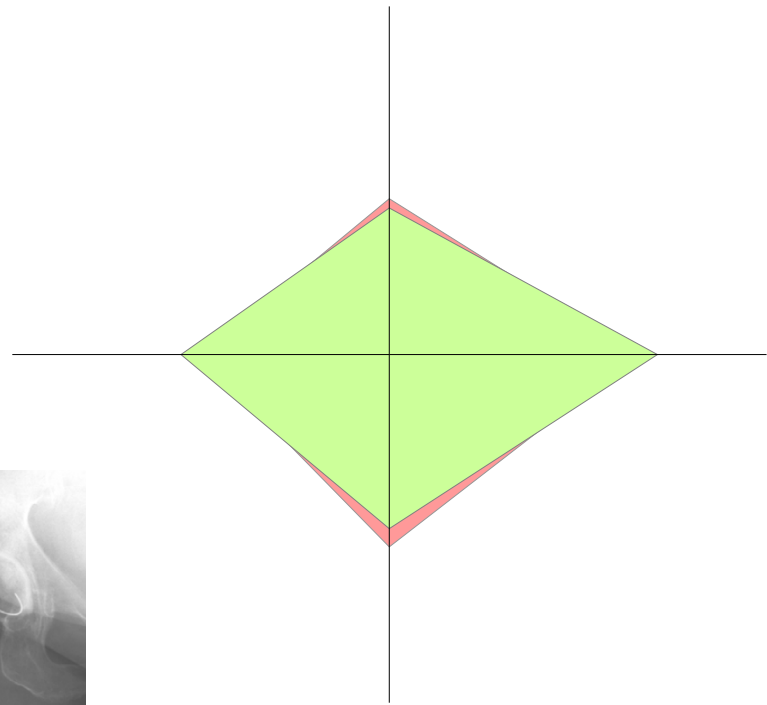
In this example, this hospital has worse outcome in five different dimensions (cardinals).

High volume central hospital

Sundsvall



Sundsvall



Case mix

	Antal patienter	Antal reop.	Frekvens	Infektion	Luxation	Lossning	Övriga
Sundsvall	638	33	4,8%	1,3%	2,8%	0,1%	1,0%
Riket	52 623	763	1,4%	0,5%	0,6%	0,1%	0,5%

Tabell 1. Sundsvallsresultat versus rikets medelvärden. Reoperationer inom 2 år (2002–2005).

	Antal patienter	Primär OA	Andel patienter < 60 år	Andel kvinnor	Andel reopererade
Sundsvall	638	85,3%	20,4%	60,9%	4,8%
Riket	52 623	81,8%	19,1%	59,4%	1,4%

Tabell 2. Patientdemografi. Sundsvallskliniken versus riket.

Reoperation @ 2 years varies: 0 – 4,8%

ST.nu Nyheter Sport Nöje Åsikter Abonn
Lokalt · Arbets&Pengar · Inrikes · Utrikes · När

bild 1 av 2



Lennart Bengtsson är verksamhetschef vid ortopedkliniken i Sundsvall. Han tycker inte att patienterna behöver vara oroliga, trots att så många får komma tillbaka hans klinik efter att de opererat höfterna.
Foto: Sören Walldin

Klicka på bilden för att beställa bilden

Flest höftoperationer får göras om i Sundsvall

SUNDSVALL (ST) 2006-10-24 03:00

Om en höftprotes går sönder gör det väldigt ont. I Sundsvall händer det oftare än på andra ställen i Sverige.
Det visar ny statistik från Höftprotesregistret.

Var tjugonde patient kommer tillbaka till Sundsvalls sjukhus redan kort tid efter att de opererat höften. Orsaken är oftast att protesen hoppat ur sitt läge. Resultatet är bland de sämsta om man jämför alla ortopedkliniker i Sverige.

[Kommentera artikeln](#)

- local analysis
- improvement programme
- no dislocation last year
 - saving: 5 X 20.000 €
- this example shows the true mission of the Register

“I wasn’t aware of our high complication rate.”

The goal with open disclosure of clinical results is to initiate a local learning and improvement process at each department



Clinical Value Compass Thinking

- It will improve the entire process
- THR is not an operation - it is a procedure

Comparisons are difficult

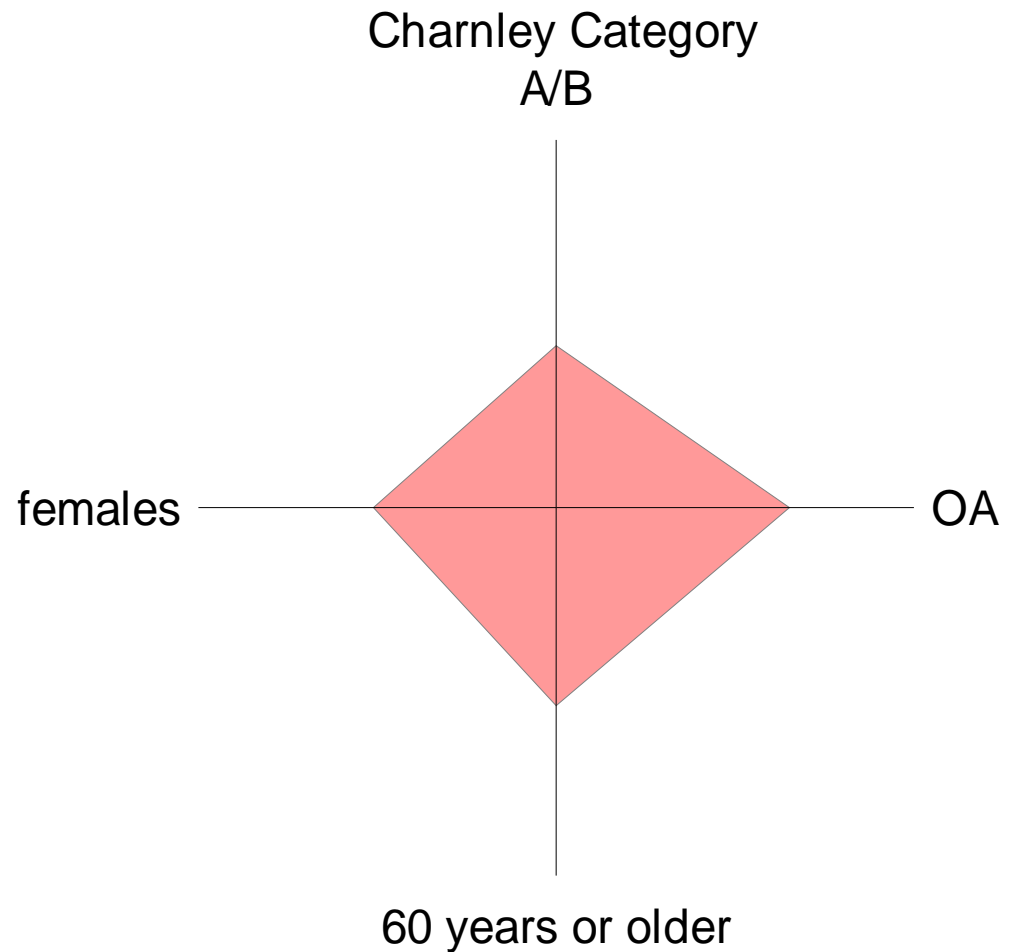
The Case-mix problem

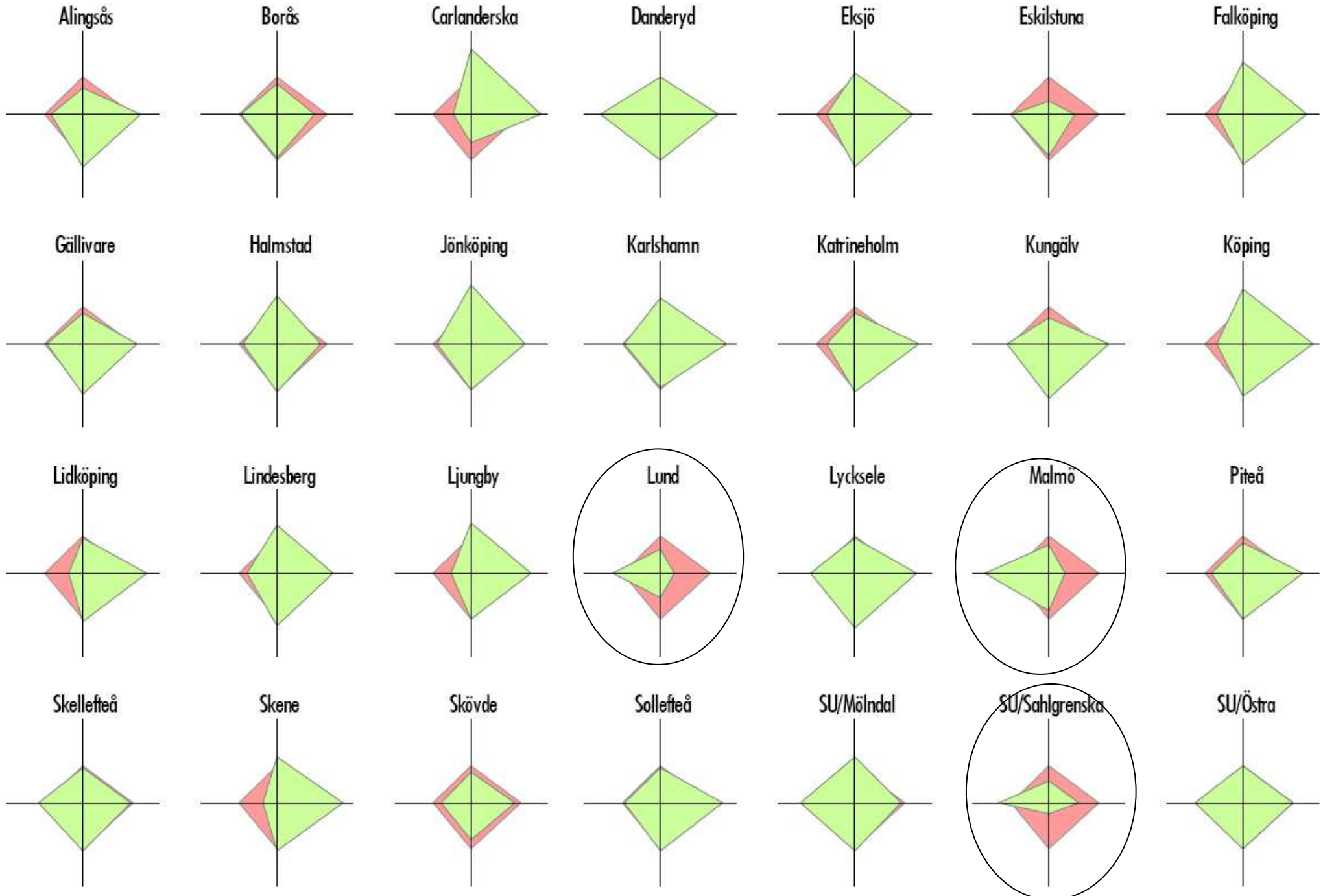
The case-mix factor is the largest individual factor that leads to misinterpretations of register results.

The case-mix is defined by specific criteria:

- gender
- diagnosis
- age
- Charnley Category

”Case-mix”-variables
nation-wide mean values (percentage)





Implant Survival per Hospital

all diagnoses, all reasons for revision and all types of implants, 1992-2004

Cup (Stem)	Period ¹⁾	Number ²⁾	OA ³⁾	60-75 yrs ⁴⁾	5 yrs	95% CL	10 yrs	95% CL
University/Regional Hospitals								
Huddinge	1992–2004	2,619	64.5%	45.2%	95.3%	±1.0%	87.6%	±2.0%
Karolinska	1992–2004	2,287	56.8%	44.9%	94.9%	±1.1%	87.4%	±2.9%
Linköping	1992–2004	2,464	68.0%	44.4%	99.0%	±0.5%	96.6%	±1.4%
Lund	1992–2004	1,949	50.1%	40.5%	97.1%	±0.9%	89.7%	±2.2%
Malmö	1992–2004	2,831	51.9%	45.8%	96.0%	±0.8%	88.1%	±1.9%
SU/Sahlgrenska	1992–2004	2,595	60.9%	41.0%	97.7%	±0.7%	91.5%	±2.0%
SU/Östra	1992–2004	2,112	75.4%	49.7%	97.5%	±0.8%	93.2%	±1.7%
Umeå	1992–2004	1,546	70.0%	48.7%	97.5%	±0.9%	94.8%	±1.5%
Uppsala	1992–2004	3,362	55.1%	39.0%	94.4%	±1.0%	86.9%	±2.0%
Central Hospitals								
Borås	1992–2004	2,307	68.4%	48.8%	97.5%	±0.7%	94.6%	±1.5%
Danderyd	1992–2004	3,599	85.8%	43.8%	96.8%	±0.7%	93.4%	±1.4%
Eksjö	1992–2004	2,232	83.5%	53.5%	96.6%	±0.9%	93.4%	±1.6%
Eskilstuna	1992–2004	1,814	59.8%	47.5%	97.9%	±0.7%	95.8%	±1.5%
Falun	1992–2004	1,833	82.9%	51.6%	96.0%	±1.3%		
Gävle	1992–2004	1,915	71.4%	47.6%	96.9%	±0.9%	84.2%	±6.5%
Halmstad	1992–2004	2,122	64.1%	48.0%	97.3%	±0.8%	93.3%	±2.0%
Helsingborg	1992–2004	1,905	72.9%	49.7%	96.4%	±1.0%	86.6%	±2.8%
Hässleholm-Kristianstad	1992–2004	4,209	83.3%	53.6%	97.9%	±0.5%	93.9%	±1.5%
Jönköping	1992–2004	2,100	79.8%	51.0%	97.5%	±0.8%	95.2%	±1.3%
Kalmar	1992–2004	2,287	65.0%	48.8%	98.3%	±0.6%	95.3%	±1.5%

The Case-Mix Problem

The Charnley classification is a highly significant predictor concerning patient related outcome – both for disease-specific and generic instruments

Patient reported results

Charnley category C patients varies

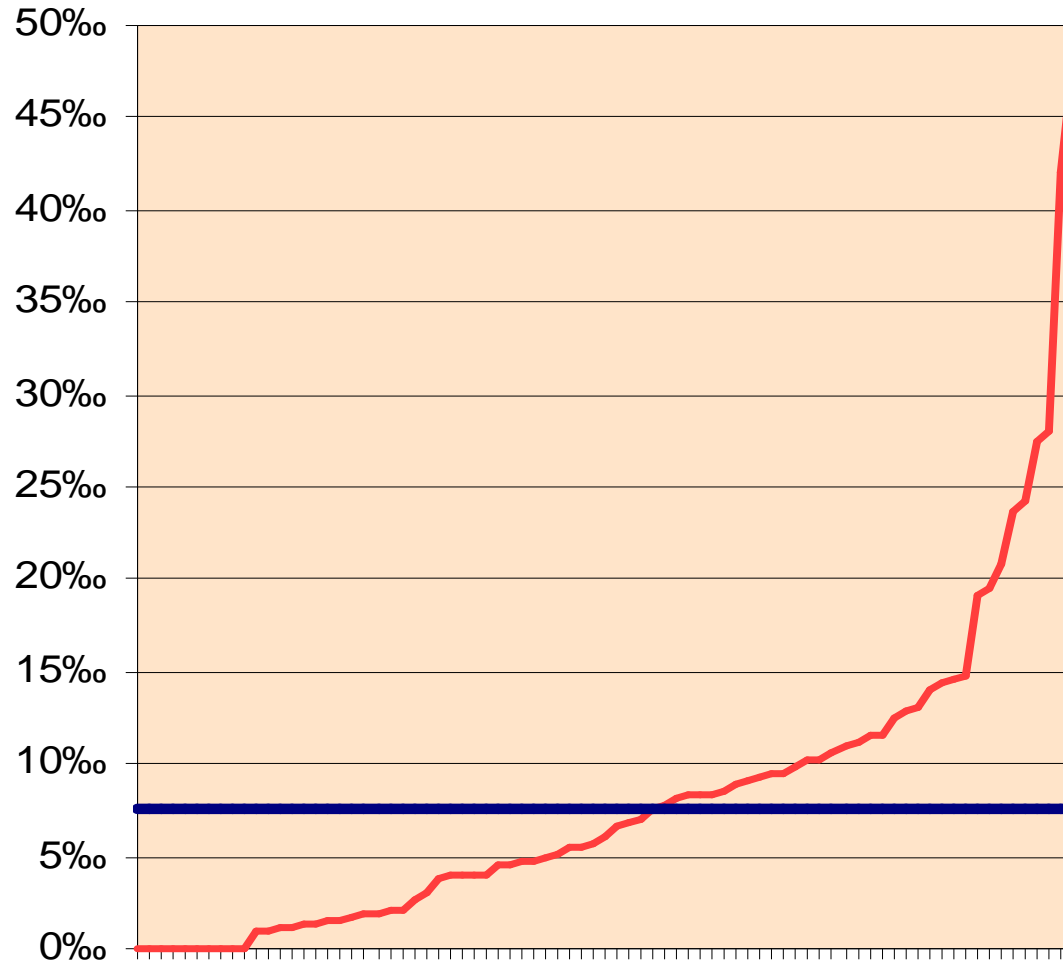
Preop frequency: 31 - 55%

Patient related outcome per clinic @ 1year
2002 - 2005

Klinik	Preoperativt				Uppföljning efter 1 år				Vinst ³⁾	Kommentar
	Antal	C-kat. ¹⁾	EQ-5D	Smärta	Antal	EQ-5D	Smärta	Tillf. ²⁾		
Universitets- och regionssjukhus										
Huddinge										Ansluter 1/9 2006
Karolinska										Ansluter 1/9 2006
Linköping										Ej ansluten
Lund	124	48%	0,28	64	70	0,72	14	13	0,44	
Malmö	79	46%	0,26	66	72	0,66	22	19	0,40	
SU/Sahlgrenska	653	49%	0,34	61	565	0,71	16	19	0,37	
SU/Östra	390	43%	0,34	64	358	0,72	19	23	0,38	
Umeå	137	49%	0,28	67	85	0,71	17	18	0,43	
Uppsala										Ansluter 1/9 2006
Länssjukhus										
Borås	528	47%	0,41	59	402	0,74	15	19	0,33	
Danderyd	43	44%	0,44	60						
Eksjö	141	43%	0,43	62						
Eskilstuna	40	50%	0,22	67						
Falun										Ej ansluten
Gävle										Anslöts 1/1 2006
Halmstad	107	34%	0,36	65						
Helsingborg										Ej ansluten
Hässleholm-Kristianstad										Ej ansluten
Jönköping	184	22%	0,37	64						

90-day mortality

primary THR 2003 - 2007



one tick - one unit

The Clinical Value Compass

Patient Satisfaction

Clinical
Outcome



Functional
Health
QoL

Cost and Utility

Batalden and Nelson,
Dartmouth Medical School.

Health economical evaluation:

Alan Williams:

"... It's a waste of time to concentrate on disease and costs.

Cost-effectiveness or utility of intervention should be measured!!..."

Health economy is controversial

- new scientific field
- decision makers often sceptical
 - no incentive for long-term results
 - not interested of total societal costs
 - *”our budget is in balance!”*

Health economical evaluation

The most important "income" or profit in health care – is patient utility – quality of life improvement



Since 2004 cost is derived by

- linking with county databases concerning costs, resources, waiting lists ...

Cost Per Patient = CPP data base

- most exact reimbursement system in Sweden
- 40 of 79 units
- nation-wide (as a standard) introduced 2009 - 2010

Nation wide mean costs:

- mean cost = 78 000 SEK (12 800 \$)
- range = 56 000 – 147 000 SEK

Health economical evaluation

Costs (A – B)

gained HRQoL x duration

Costs/QALY gained
Quality Adjusted Life Years

Höftdispensär

En sammanställning av klinikens utfall i jämförelse med hela landet.

Dessa resultat bygger på vad som fanns i databasen 2008-08-07 och innefattar registreringar från 74 kliniker.



Variabel	Din klinik			Hela landet		
	Preoperativt	1-Årsuppfölj.	Skillnad	Preoperativt	1-Årsuppfölj.	Skillnad
Antal registreringar	738	902		34 712	26 956	
Tillfredsställelse (VAS)		20			18	
Smärta (VAS)	61	17	44	61	15	46
EQ-5D Index	0,35	0,69	0,35	0,40	0,76	0,36

Cost-utility: $78\ 000 / (0,36 \times 10)$

QALY: 22 000 SEK (ca 3 540 \$)

Not adjusted for inflation, aging, death and reoperations!

Table 2. Cost per QALY of healthcare interventions (adapted from references 2–4)

Intervention	£/QALY at 1990 prices
Cholesterol testing and diet therapy (all adults aged 40–69)	220
Neurosurgical intervention for head injury	240
GP advice to stop smoking	270
Neurosurgical intervention for subarachnoid haemorrhage	490
Antihypertensive treatment to prevent stroke (ages 45–64)	940
Pacemaker implantation	1,100
Hip replacement 	1,180
Valve replacement for aortic stenosis	1,410
Cholesterol testing and treatment (all adults aged 40–69)	1,480
Docetaxel (as opposed to paclitaxel) in treatment of recurrent metastatic breast cancer	1,890*
CABG (left main-vessel disease, severe angina)	2,090
Kidney transplantation	4,710
Breast cancer screening 	5,780
Heart transplantation	7,840
Cholesterol testing and treatment incrementally (all adults aged 25–39)	14,150
Home haemodialysis	17,260
CABG (one-vessel disease, moderate angina)	18,830
Hospital haemodialysis	21,970
Erythropoietin treatment for anaemia in dialysis patients (assuming 10% reduction in mortality)	54,380
Addition of interferon- α 2b to conventional treatment in newly diagnosed multiple myeloma	55,060 [§]
Neurosurgical intervention for malignant intracranial tumours	107,780
Erythropoietin treatment for anaemia in dialysis patients (assuming no increase in survival)	126,290

* Adjusted to 1990 prices using *Hospital and Community Health Service Pay and Prices Index, Unit Costs of Health and Social Care*. PPSRU, 1996.
 $(2,431 \div 200.7 \times 155.6 = 1,890)$. [§] Translated into 1990 prices, as above

Costs/QALY gained

- even better if all societal costs were known

Waiting time mean costs 2 700 patients:

- 73 000 SEK /1 year (12 000 \$)
- 14 000 X 73 000 = 1 bil SEK!

Health economical evaluation

THR is not only one of the best operations ever introduced but also one of the most cost-effective



The Swedish Hip Register has shown

We can and need to monitor and describe
our current and changing
practice continuously, and then provide
this information public to all parties



Advantages of a National Registry

- Independent
- Prospective data
- Comparative outcomes
- Simultaneously compares all treatments
- Very large numbers
- Provides data that is not available from any other source
- Describes and Monitors current/changing practice
- Able to identify outcome outliers

Advantages of a National Registry

- Includes all centers, no performance bias
- Wide applicability and relevance
- Can be used to answer multiple questions
- Answers questions not possible to do in any other way
- Hospital, Regional and International comparisons
- The information they provide improves performance
- Result in considerable savings /very cost effective
- Hypothesis generation

Improvement of the Arthroplasty Registries

- Establish a mechanism with the purpose of ensuring and maintaining continual quality improvement
- Provide hospital and community based comparative outcomes data
- Establish a mechanism for continuous public reporting of outcome measurements

Thank You for Your Attention



Department of Orthopaedics
Sahlgrenska University Hospital,
Göteborg, Sweden



Conclusion

- Outcome assessment through the Register has had a profound impact on total hip replacement care in Sweden.
- These efforts must be a continuous process – a steady state situation will never develop.
- Enormous potential for clinical research

Conclusion

- For the healthcare providers— large economic savings and public information of results
- For the patient optimal treatment modalities identified and described on the web
- For the orthopaedic community outcome facts are present - confidential and public

