

*Lessons from the  
Kaiser Permanente  
Total Joint Replacement Registry*

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Director of Surgical Outcomes & Analysis*

**FDA Sentinel Network Meeting**

**March 2007**

- ❖ **Background Total Joint Replacement (TJR)**
- ❖ **Importance of establishing a TJR network**
- ❖ **Kaiser Permanente Total Joint Registry**
  - Development/Implementation
  - Cost savings and changes in practice
  - Expansion within & beyond orthopedics
  - Key elements for success

## **Total Joint Replacement in the United States**

- 600,000 TJRs each year (Hip & Knees)
- 2030 projected volume (Kurtz et al., 2006)
  - TKA 3.48 million per year
  - THA 572,000 per year
- Annual Hospital Charges by 2015 (Ong et al., 2007)
  - Primary THA \$17.4 billion, TKA \$40.8 billion
  - Revision THA \$3.8 billion, TKA \$4.1 billion

## **In the United States, lack mechanism to**

- Identify TJR revision rates
- Identify patients at risk for failures/revisions
- Assess post-market implant performance
- Immediately identify and notify patients w/recalled implants
  - **Hip Stem Failure (late 90's)**
    - Silent failures until reach catastrophic level
    - Still presenting
  - **Hip Cup Recall (2000)**
    - 17,500 patients with recalled implant
    - Traces of machine oil on the cup

# *Importance of a TJR System*

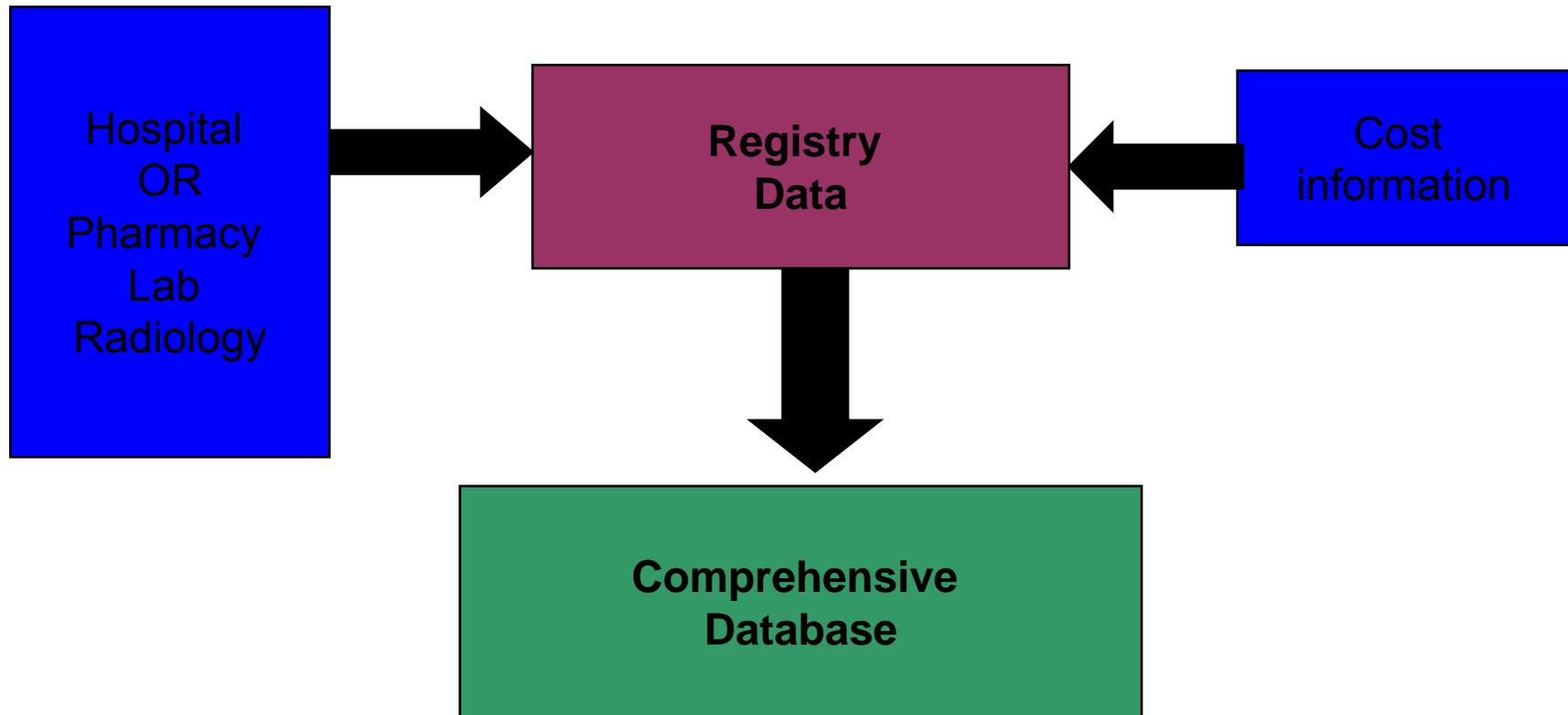


- **Swedish Hip Registry** (Karrholm et al., 2007)
  - Established in 1979
  - Epidemiology of revision surgeries
  - 300,000 TJRs registered
  - National Board of Health & Welfare/Swedish Association of Local Authorities & Regions
  - Decreased revision rates from 8% to 4% by providing timely feedback to surgeons on techniques
  - Focused on a minimal dataset
    - Patient
    - Technique
    - Implant

- Nation's largest nonprofit health plan
- Integrated, pre-paid health care delivery system
- 8.6 million members
- Over 12,800 physicians & 152,800 employees
- 8 regions (So & No CA, Northwest, Hawaii, Colorado, Mid-Atlantic, Georgia, Ohio)
- 37 medical centers and 431 medical offices
- 14,000 TJRs each year

- **Initiated and developed by orthopedic surgeons in 2001**
- **Standardization of TJR documentation**
  - Pre-op form
  - Intra-op forms
  - Follow-up form
- **Database of all total joint procedures**
  - Patient demographics
  - Surgical techniques
  - Implant characteristics
  - Outcomes

# *Kaiser Permanente Registry*



<http://TJRregistry.zion.ca.kp.org>

# *Kaiser Permanente Registry*



- **95% voluntary participation from over**
  - 300 Surgeons
  - 38 Centers
- **Over 50,000 total joints registered**
- **Five Participating KP Regions**

So CA	Colorado	Hawaii
No CA	Northwest	

**Epic Hyperspace - INITIAL DEPARTMENT - BUILD - KTAZP1584.CRDC.KP.ORG PRODNAM**

Desktop Action Patient Care Billing Reg/ADT CRM/CM Reports Report Mgmt Tools Admin Help

Back Forward Home Schedule In Basket Chart Encounter Tel Enc Hospital Chart Patient Lists Secure Print Log Out

Home Zznatest,Adultmale

**Zznatest, Adultmale** MRN: E12129 Room/Bed: ZZNATEST R\* Age: 68 yrs Sex: M DOB: 11/20/1938 Allergies: Pcn Class, Bee Stings\* Isolation: None Code: None Attending: Tom, Richard D\* LOS: 0days kp.org: Inactive

**Doc Flowsheet** (Resize)

File Add Row Add Group Add LDA Cascade Add Col Insert Col Compact Last Filed Graph Details Go to Date Values By Refresh Legend

Flowsheet: TOTAL JOINT ARTHRO... Meds order entry BLEEDING DURING PREGNANCY CODE BLUE OUTCOME CODE BLUE CODE TEAM OT FLOWSHEET

TOTAL JOINT ARTHROPLA...	<input checked="" type="checkbox"/>	03/02/07	
<b>Nursing Assessment</b>	<input checked="" type="checkbox"/>	1100	
Surgeon History and Physi...	<input checked="" type="checkbox"/>		
Knee ROM for TKR	<input checked="" type="checkbox"/>		

**Nursing Assessment**

Operative Site

Bilateral Procedure

Average Pain Level in Joint Replaced?

Ambulatory Support

**Surgeon History and Physical**

Charnley Classification

Previous Operations in this Joint

Number of Surgeries

**Knee ROM for TKR**

Extension

Hyperextension

Extension Loss

Flexion

Value	Comment	Time Taken	Time Recd	User Taken	User Recd	Show Audit	File

Hotkey List Exit Workspace

MARY SEGGERMAN My Open Charts 9:22 AM

start Mary E Se... 3 Intern... Epic Hyperspac... Epic Hyperspac... 2 Samet... Microsoft ... 11:22 AM

**Epic Hyperspace - INITIAL DEPARTMENT - REGN - KTAZD1948 REGNNAB**

Desktop Action Patient Care Billing Hospital Billing Reg/ADT Surgery CRM/CM Reports Report Mgmt Tools Admin Help

Back Forward Home Schedule In Basket Chart Encounter Tel Enc Hospital Chart Patient Lists Secure ED Manager ED Map Track Board ED Chart

Home Inpatient Admin **Test, Ortho**

**Test, Ortho** MRN: E12162 Room/Bed: Age: 76 yrs Sex: F DOB: 10/10/1930 Allergies: Not on File Isolation: None Code: None Attending: N/A LOS: 0days kp.org: Inactive

**Doc Flowsheets**

Flowsheet: TOTAL JOINT ARTH ...

Value	Comment	Time Taken	Time Recd	User Taken	User Recd
		03/02/07			
		1100			
<b>Nursing Assessment</b>					
Operative Site		LEFT,KN...			
Time since surgery		6 WEEKS			
Average Pain level in joint		4			
Satisfaction with surgery		8			
<b>Complications</b>					
Is a revision indicated?		NO			
Knee Complications		ASEP L...			
Hip Complications					
Wound Problem					
<b>Other Problems</b>					
Leg length Inequality					
Leg Length Inequality in cm					
Medical Complication					
Specify Medical Complication					
<b>Radiographic Assessment</b>					
X-Ray					
Loosening Acetabulum					
Loosening Femur					
Loosening Tibia					
Loosening Patella					
Osteolysis of Acetabulum					
Osteolysis of Femur					
Osteolysis of Tibia					
Osteolysis of Patella					
<b>Assessment</b>					
Charnley Classification					
Ambulatory Support					
<b>Knee ROM for TKR</b>					
Extension					
Hyperextension					
Knee Extension Loss					

**Additional Info for Complications-Knee...**

**Knee Complications**

Value Range for Row

Back Next Clear

- ARTHROFIBROSIS
- ASEPTIC LOOSENING
- DEATH
- DVT
- EFFUSION
- HEMATOMA
- HETEROTOPIC OSSIFICATION
- INSTABILITY
- MUA
- NERVE PALSY
- NEUROMUSCULAR INJURY
- OSTEOLYSIS
- PAIN
- PATELLOFEMORAL FRACTURE
- POLY WEAR
- SEROMA
- STIFFNESS (ROM LESS THAN 90)

Back Next Clear

Last Filed Value

\*\*No data filed\*\*

Hotkey List Exit Workspace

MARY SEGGERMAN Canceled Ord, My Open Charts, Patient Call Copy, Results, Verbal Order Cosign 11:49 AM

start Mary E Se... Epic Hyperspac... Microsoft ... Rachel Eli... 11:49 AM

**Epic Hyperspace - INITIAL DEPARTMENT - REGN - KTAZD1948 REGNNAB**

Desktop Action Patient Care Billing Hospital Billing Reg/ADT Surgery CRM/CM Reports Report Mgmt Tools Admin Help

Back Forward Home Schedule In Basket Chart Encounter Tel Enc Hospital Chart Patient Lists Secure ED Manager ED Map Track Board ED Chart

Home Inpatient Admin **Test,Ortho** Epic

MRN	Room/Bed	Age	Sex	DOB	Allergies	Isolation	Code	Attending	LOS	kp.org
E12162		76 yrs	F	10/10/1930	Not on File	None	None	N/A	0days	Inactive

Snapshot  
Chart Review  
Results Review  
Flowsheets  
Problem List  
History  
Letters  
Demographics  
Order Entry  
Imm/Injections  
Allergies  
Medications  
Forms  
Doc Flowsheets  
Enter/Edit Results  
**Visit Navigator**  
Hotkey List  
Exit Workspace

**Visit Navigator (3/2/2007 visit with ROGERS)**

Images Questionnaires Admin Benefits References SmartSets Scans Open Orders Change PCP Print AVS Media Manager

Allergies **Not On File**  
Last Vitals BP: P: T: T Src: Resp: W: H:  
BMI: , BSA:

**Charting**

- Chief Complaint
- Vitals
- BestPractice
- Nursing Notes
- Progress Notes**
- Diagnoses
- Orders
- Pt. Instructions
- LOS & Follow-up
- Close Encounter

**Progress Notes (F3 to enlarge)**

100% 11 B I U S A

**Status Report for Total Joint Arthroplasty**

Ortho Test **No chief complaint on file.**

Operative procedure: { KNEE LOCATION :27499} {HIP LOCATION :27334} replacement  
Surgery date: \*\*\*. Time since surgery: 6 WEEKS  
Surgeon: Mary Seggerman  
Hospital location: \*\*\*

**Postoperative Complications:**  
Knee Complications: ASEPTIC LOOSENING;HETEROTOPIC OSSIFICATION;INSTABILITY  
Operative Site: LEFT;KNEE  
Hip Complications: HEMATOMA

**SUBJECTIVE:**  
Symptoms in operated joint: {HX KNEE POST ARTH SX ORT\*:13243}  
On a scale of 0 to 10 with 0 = no pain and 10 = the worst possible pain, the patient reports an average pain level of Average Pain level in joint replaced?: 4 currently.

Note status:  Sign at closing of section  Sign at closing of encounter

Restore Close F9 Previous F7 Next F8

**Diagnoses (View Only)**  
[Go to Diagnosis Entry \(Ctrl+G\)](#)  
None

**Orders (View Only)**  
[Go to Order Entry \(Ctrl+O\)](#)  
None

**Patient Instructions**  
None

View Hotkeys

MARY SEGGERMAN Canceled Ord, My Open Charts, Patient Call Copy, Results, Verbal Order Cosign 11:55 AM

start Mary E Se... Intern... Epic Hyperspac... 2 Samet... Microsoft ... Rachel Eli... 11:55 AM

**Epic Hyperspace - INITIAL DEPARTMENT - REGN - KTAZD1948 REGNAB**

Desktop Action Patient Care Billing Hospital Billing Reg/ADT Surgery CRM/CM Reports Report Mgmt Tools Admin Help

Back Forward Home Schedule In Basket Chart Encounter Tel Enc Hospital Chart Patient Lists Secure ED Manager ED Map Track Board ED Chart

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**Test, Ortho** MRN: E12162 Room/Bed: Age: 76 yrs Sex: F DOB: 10/10/1930 Allergies: Not on File Isolation: None Code: None Attending: N/A LOS: 0days kp.org: Inactive

**Visit Navigator (3/2/2007 visit with ROGERS)**

Chart Review Images Questionnaires Admin Benefits References SmartSets Scans Open Orders Change PCP Print AYS Media Manager

Results Review Allergies **Not On File** Last Vitals BP: P: T: T Src: Resp: W: H: BMI: BSA:

Problem List

History

Letters

Demographics

Order Entry

Imm/Injections

Allergies

Medications

Forms

Doc Flowsheets

Enter/Edit Results

**Visit Navigator**

Episodes of Care

**Charting**

- Chief Complaint
- Vitals
- BestPractice
- Nursing Notes
- Progress Notes
- Diagnoses
- Orders
- Pt. Instructions
- LOS & Follow-up
- Close Encounter

**Progress Notes**

[Create Note](#)

**Notes**

MARY SEGGERMAN Status: Sign at close enc Fri Mar 2, 2007 11:56 AM [Duplicate](#)

[Edit](#) [Delete](#)

**Status Report for Total Joint Arthroplasty**

Ortho Test: No chief complaint on file.  
Operative procedure: left knee replacement  
Surgery date: 1/23/07. Time since surgery: 6 WEEKS  
Surgeon: Mary Seggerman  
Hospital location: Oakland

**Postoperative Complications:**  
Knee Complications: ASEPTIC LOOSENING;HETEROTOPIC OSSIFICATION;INSTABILITY  
Operative Site: LEFT;KNEE  
Hip Complications: HEMATOMA

**SUBJECTIVE:**  
Symptoms in operated joint: stiffness  
On a scale of 0 to 10 with 0 = no pain and 10 = the worst possible pain, the patient reports an average pain level of Average Pain level in joint replaced?: 4 currently.  
On a scale of 0 to 10 with 0 = extremely dissatisfied and 10 = extremely satisfied, the patient reports an average satisfaction level of Satisfaction with surgery outcome?: 8 currently.  
Is a revision indicated?: NO

The patient is a(n) office worker .  
The patient can walk: uphill, time 8 minutes, eases after Physical Therapy 2/wk . Self-care capabilities include donning shirt/pants .  
Ambulatory Support: NO  
Ambulatory support(s) used currently:a single cane  
Chamley Classification: C (MULTI-JOINT PROBLEM OR SYSTEMIC DISEASE)

**OBJECTIVE:**  
VITAL SIGNS:BP: (not recorded), Pulse: (not recorded), Resp: (not recorded), Temp: (not recorded), Temp src: (not recorded)  
AFFECTED AREA: left knee  
Inspection:skin Intact the wound is healed  
Palpation: tenderness anterior knee  
Patient walks with { PE LIMP:20456}  
ROM of right hip: GENERAL: no acute distress

Hotkey List [View Hotkeys](#)

Exit Workspace

MARY SEGGERMAN Canceled Ord, My Open Charts, Patient Call Copy, Results, Verbal Order Cosign 12:01 PM

start Mary E Se... 2 Intern... Epic Hyperspac... 2 Samet... Microsoft ... Rachel Eli... 12:01 PM

**Episodes of Care** [Close X]

New Episode Resolve Episode Delete Episode Link/Unlink Visits Episode Report Episode Flowsheet Encounter Review Open Enc Display Options Refresh

**Ortho Noted: 1/11/2007**

- 03/02/2007 - Office Visit by Rogers, Allen S (M.D.) in MOFAM
- 01/15/2007 - Office Visit by Abad-Del Mar, Maria Karina Faelnar (M.D.) in OA
- 01/11/2007 - Office Visit by Abad-Del Mar, Maria Karina Faelnar (M.D.) in OA
- 01/11/2007 - Office Visit by Abad-Del Mar, Maria Karina Faelnar (M.D.) in OA

**Selected Episode:**

Name: Ortho

Status: Active

Type: SURGERY [7]

Comments:

Noted: 1/11/2007 Resolved:

Current Visit Linked to Episode

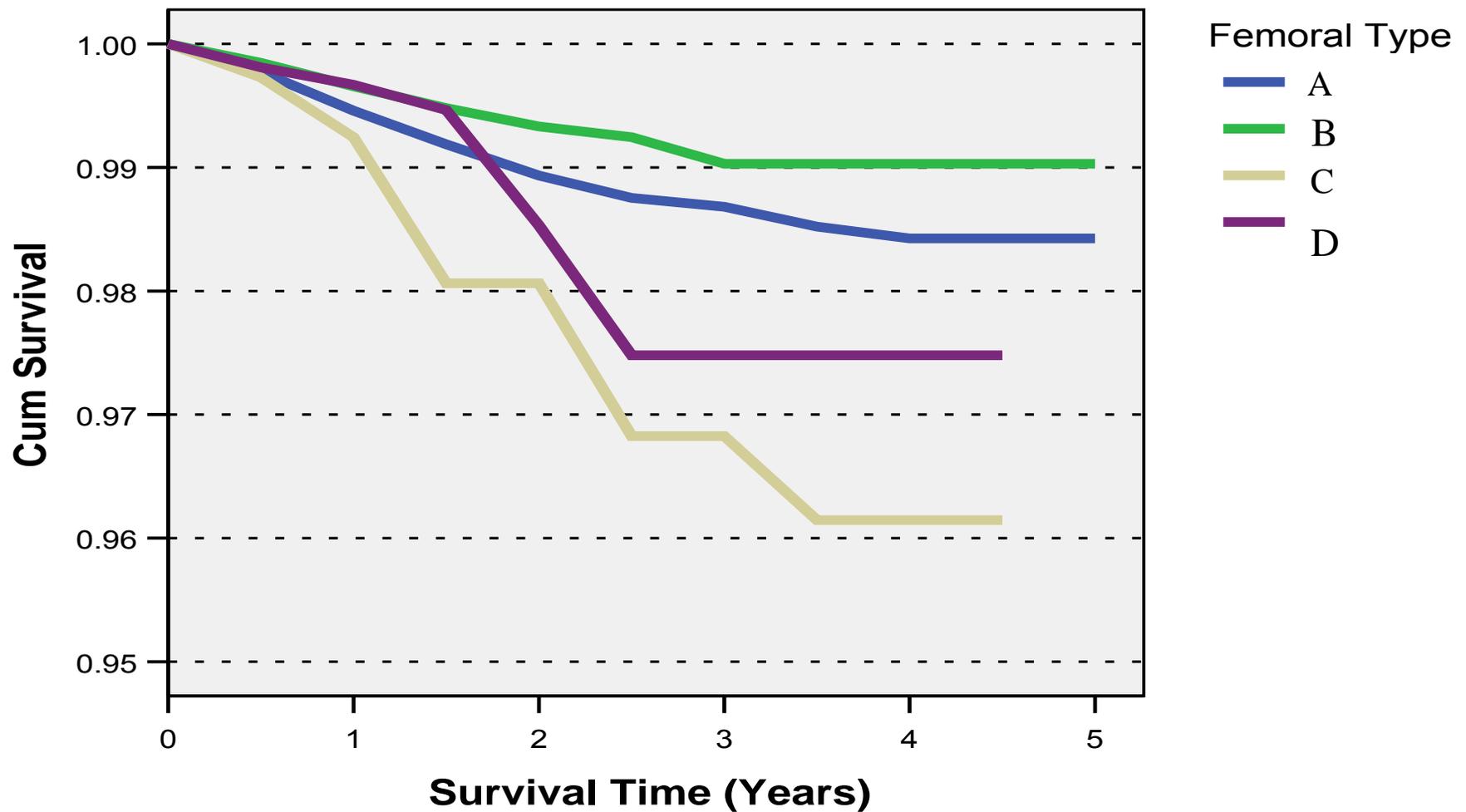
SmartForms Available Problem List Episode Report Encounter Report

Back Links Copy Refresh Print

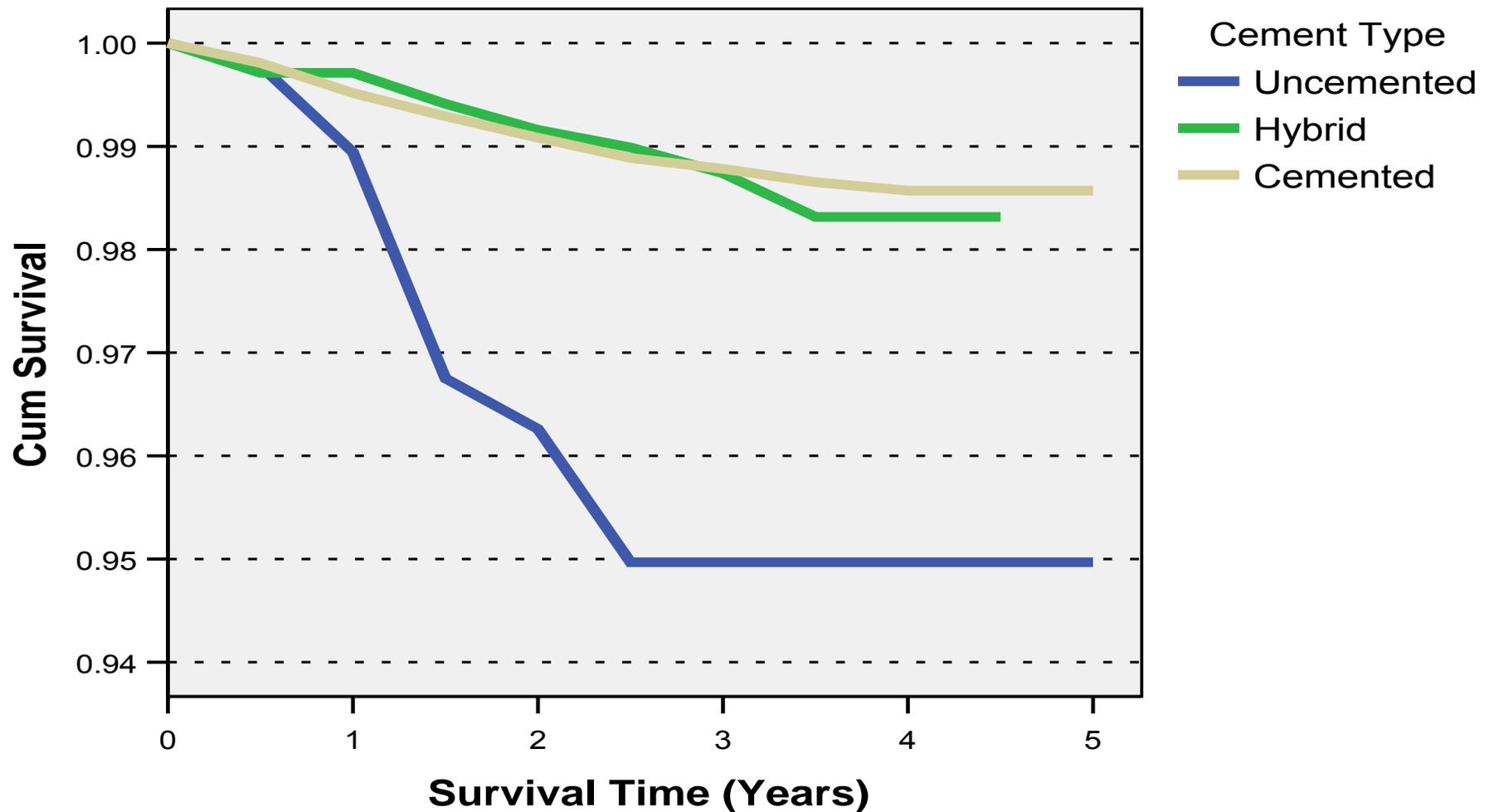
**Default Flowsheet Data (all recorded)**

	03/02/07	01/15/07	01/11/07	01/11/07
<b>TOTAL JOINT ARTHROPLASTY STATUS REPORT ORTHO REG OP NATL</b>				
	1100	1100	1100	0900
<b>NURSING ASSESSMENT</b>				
Operative Site	LEFT;KNEE	LEFT;KNEE	LEFT;KNEE	LEFT;KNEE
Time since surgery	6 WEEKS	--	6 WEEKS	--
Average Pain level in joint replaced?	4	--	2	5
Satisfaction with surgery outcome?	8	--	8	--
<b>COMPLICATIONS</b>				
Is a revision indicated?	NO	--	NO	--
	ASEPTIC LOO-		PAIN;STIFFN-	STIFFNESS

## TKA Femoral Survival Function



## TKA Survival Function by Cement Category



- **The Registry has successfully identified and monitored 2 recalls and advisories**
  - Cost savings in prevention of chart review to identify patients with recalled components
- **The Registry provides a mechanism for immediate identification and notification**

# *Study: TKA Obesity & Infections*



- **Obesity is a risk factor for post-operative infections**
  - 52% of KP's TKA patients are obese
  - Obese patients have 2 times higher risk of post-operative infection
- **Implemented a multi-center exercise/weight loss program to determine if it can prevent or delay the need for TKA in obese patients**
- **Preventing 1 post-operative infection, saves \$100,000!**

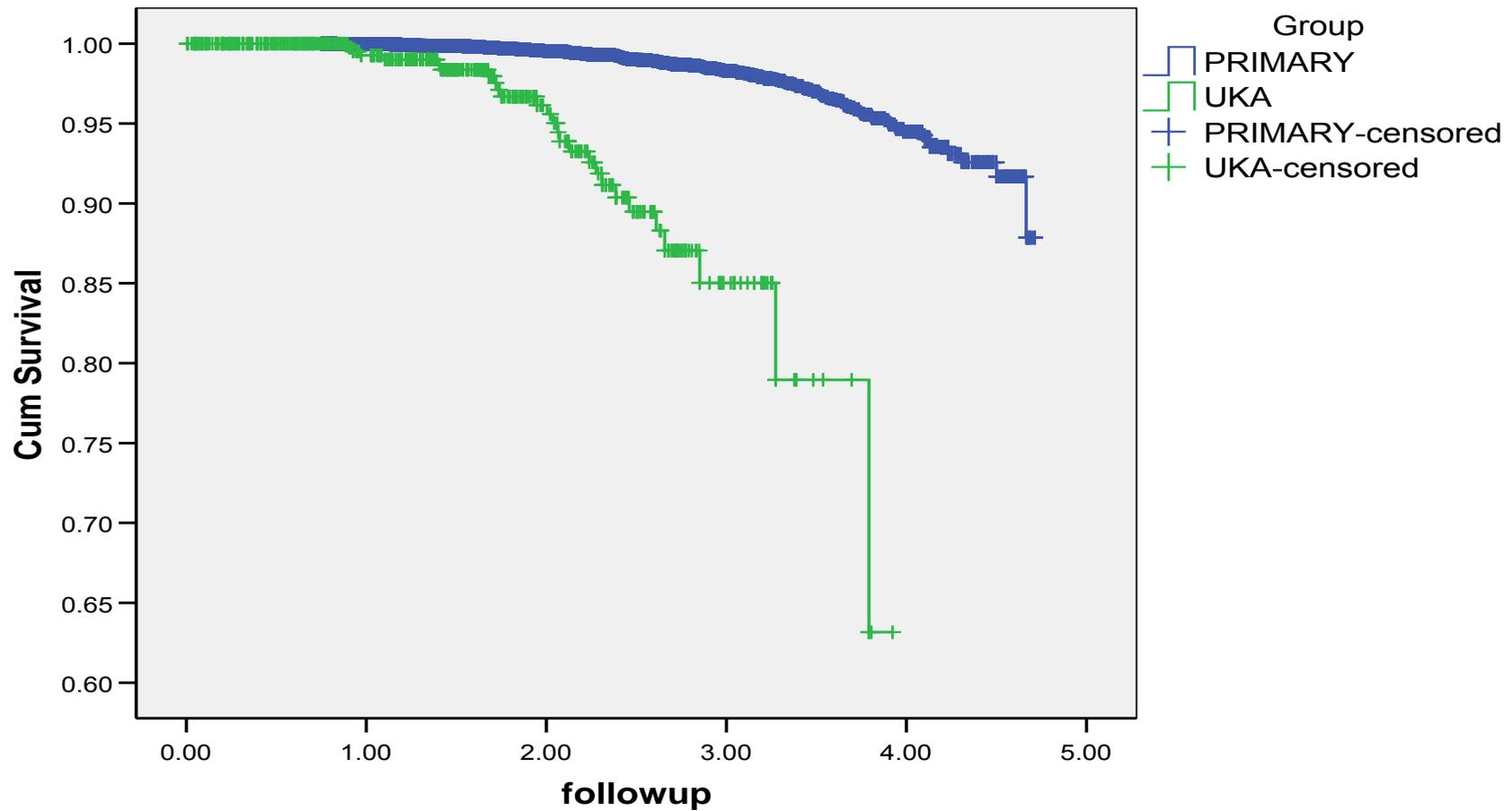
## **(1693 Primary, 277 Revisions)**

- **Revision THA patients had higher dislocation rates than primary THA patients (5.1% vs 1.7%)**
- **Patients with ASA scores of 3 or 4 odds of dislocation were 2.3 times higher than patients with scores of 1 or 2**
- **Patients with rheumatoid arthritis had higher dislocation rates**

# Study: Partial knee replacement (UKA) (N=601)



### Survival Functions



## *Cost Savings: Behavior Change*



- **In 2006, Registry findings were shared with all orthopedic surgeons within Kaiser Permanente nationally**
  - UKA revision rate 11% at 2 years
  - TKR revision rate 1% at 2 years
- **Rate of UKA dropped from 4% to 2%**
- **Prevented 16 revisions through information sharing from the registry**
- **Cost savings of over \$560,000**

- **Registry expansion within Orthopedics**
  - ACL Registry
  - Distal Radius Fracture Registry
  - Spinal Surgery Registry
  - Hip Fracture Registry
  - Arthroscopic Shoulder Implant Registry
- **Future Planned Areas for Expansion (2007-8)**
  - Cardiac Stents
  - Cardiac Defibrillators
  - Cardiac Surgery Valves

# *Lessons from the KP Registry*



- **Need consensus on scope of project**
  - Specific aims and hypotheses will determine data collection
  - Not an outcomes study
    - Focus on minimal dataset
    - Use Registry as foundation for more in-depth research questions
- **Benchmarking is important for developmental phase**
- **Involve physicians and front line staff in development, data collection, and interpretation of data to establish ownership**
- **Reduce respondent burden**
  - Replace existing systems to avoid duplication of work
  - Create standards of documentation
  - Extract data from other existing administrative databases whenever possible to avoid duplication of effort

- **Incentives for voluntary participation**
  - Minimal burden of documentation at the point of care
  - Physician and staff involvement in development in all phases of the project
  - Timely feedback on techniques, patient risk factors and early failure of implants
  - Physician specific data upon request (i.e., case volume, outcomes)
  - Identification & notification of recalls/advisories
  - Support for research projects

## **Kaiser Permanente TJR Registry:**

*A successful voluntary post-market surveillance system that provides*

- Immediate identification and notification of recalled components
- Identification of patients at risk for failures and revisions
- Identification of clinical best practices for improving patient quality
- The framework for more in-depth research studies