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TABLE E-1 Data Recorded and Analyzed

Data Points by Category
Preoperative demographics
Sex
Date of birth
Age *(yr)* at index surgery
Height *(m)*
Weight *(kg)*
Body mass index *(kg/m^2)*
Medical comorbidities
ASA physical status classification system grade*
Operative extremity (R/L)
Diagnosis
Procedural data
Index procedure (i.e., ACL reconstruction)
Index surgeon
Graft type (e.g., hamstring autograft)
Other procedures (e.g., meniscal repair)
Type of preoperative antibiotic
Time of preoperative antibiotic delivery
Time of surgical start (i.e., incision time)
Time of surgical stop
Total tourniquet time *(min)*
Use of flash sterilization during case
Total operative time *(min)*
Total room time *(min)*
Postoperative data
Date of presentation with knee sepsis
Time elapsed between index surgery and diagnosis of knee sepsis *(days)*
Clinical findings associated with knee sepsis (e.g., fever and joint effusion)
Knee aspiration data (e.g., Gram stain, cell counts, and percent polymorphonuclear neutrophil leukocytes)
Laboratory serology values (e.g., complete white blood-cell count, erythrocyte sedimentation rate, and C-reactive protein)
Microbiologic results (i.e., synovial fluid culture and sensitivity)
Dates of hospitalization
Duration of hospitalization *(days)*
Type of surgical treatment for knee sepsis (e.g., arthroscopic lavage and debridement)
Dates of surgical procedures
Number of surgical procedures
Status of ACL graft after debridement (e.g., retained versus removed)
Type of long-term antibiotic therapy (e.g., intravenous versus oral)

*ASA = American Society of Anesthesiologists.

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TABLE E-2 Patient Demographics, Procedural Data, and Clinical Findings by Temporal Cohort

Date of Op.	Sex/Age in Years/ ASA Class*	Procedural Data				
		Additional Surgery†	OR No.‡	Graft Type§	Op. Time *(min)*	Flash Sterilization
Cohort 1						
12/14/01	M/36/1	MM	NS	HS autog.	134	Y
1/8/02	M/29/1	None	NS	HS autog.	130	Y
1/24/02	M/25/1	None	NS	HS autog.	88	Y
Cohort 2						
1/16/03	M/26/1	MMR	12	BPTB allog.	309	Y
2/25/03	M/31/1	None	11	HS autog.	180	N
3/28/03	F/32/2	MCL repair	18	Tib Ant allog.	312	N
Cohort 3						
6/18/03	M/27/1	None	15	BPTB autog.	247	Y
7/7/03	M/29/1	MMR	13	HS autog.	218	N
7/29/03	M/35/1	MM	18	HS autog.	190	N
Cohort 4						
12/4/07	M/27/2	MMR	17	BPTB autog.	218	N
12/6/07	M/33/1	None	1	Tib Ant allog.	181	N
1/3/08	M/23/1	None	1	HS autog.	146	N
1/3/08	F/29/2	None	18	HS autog.	162	Y
1/25/08	M/32/2	None	14	HS autog.	190	N
2/19/08	M/23/1	None	1	HS autog.	147	N

*In the American Society of Anesthesiologists (ASA) classification system, class 1 indicates a normal healthy patient and class 2, a patient with mild systemic disease. †MCL = medial collateral ligament, MM = medial meniscectomy, and MMR = medical meniscus repair. ‡OR = operating room, and NS = not specified. §HS = hamstring, BPTB = bone-patellar tendon-bone, Tib Ant = tibialis anterior, allog. = allograft, and autog. = autograft. #WBC = white blood cell. **The values are given as cells/mm^3 for WBC count, mm/hr for erythrocyte sedimentation rate (ESR), and mg/dL for C-reactive protein (CRP). ††CNS = coagulase-negative *Staphylococcus*, ‡‡R = retained, Rem. = removed, and U = unknown.

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TABLE E2 (*continued*)

Clinical Findings						
Time of Diagnosis *(days postop.)*	WBC Count from Knee Aspirate# *(cells/mm^3)*	Serology Data (WBC/ ESR/CRP)**	Culture/ Sensitivity††	Incision and Drainage	Day Ad-mitted	Graft Status After Incision and Drainage‡‡
9	100,000	10.1/58/23.2	CNS/clindamy cin and vancomycin	1	6	U
13	53,333	7.9/86/17.9	CNS/pan-sensitive	1	8	R
16	34,222	5.1/54/15.2	No growth	1	3	R
90	60,400	6.4/21/0.6	No growth	1	1	R
15	31,240	10.2/69/12.1	CNS/pan-sensitive	1	7	R
17	No aspirate	18.2/46/3.1	*Serratia marcescens*/ pan-sensitive	3	4	R
11	83,333	8.8/132/7.2	CNS/pan-sensitive	1	6	R
23	68,000	12.1/82/7.8	CNS/pan-sensitive	3	9	Rem.
13	26,000	7.1/72/14.2	CNS/pan-sensitive	1	4	R
141	56,000	8.4/26/0.12	No growth	5	13	Rem.
126	54,400	7.8/22/4.6	CNS/U	2	4	R
89	40,222	10.2/84/7.9	CNS/clindamycin and vancomycin	1	6	R
12	34,100	10.6/110/15.5	CNS/pan-sensitive	2	9	R
32	6,789	9.8/108/13.2	No growth	3	6	R
35	73,300	12.2/21/19.7	No growth	1	5	R

Best Practices Incorporated into the Anterior Cruciate Ligament (ACL) Clinical Pathway

Goals

- Create structured environment in which a team approach is encouraged and best practices of infection prevention are a shared duty between the patient and all allied health personnel.
- As a team, exercise and enforce zero tolerance for patient or provider deviation from best care practices and/or the ACL Clinical Pathway.

Surgical Equipment

Initiatives to eliminate the need for flash sterilization[1,2]

- Existing ACL reconstruction sets are standardized and additional sets purchased.
- Disposable equipment and instrumentation purchased (e.g., reamers, drill-bits, and Beath pins).
- New policy stipulating availability of sterile equipment limits number of ACL reconstructions scheduled per day.

Preoperative Care

Initiatives to optimize early care through patient education and preparation[3-5]

- ACL Clinical Pathway for all patients with a standardized approach to the following:
  - Education materials (e.g., "Anterior Cruciate Ligament Surgery: What You Should Expect")
  - Preoperative instructions (e.g., "Anterior Cruciate Ligament Surgery: What is Expected of You")
  - Informed consent is standardized
  - Physician orders are standardized
  - Preoperative physical therapist consultation
  - 2% chlorhexidine soap provided for preoperative showers ×3 (twenty-four hours before surgery)[6,7]

Day of Surgery and Preoperative Policies

Room Preparation

- Technician inspects ACL reconstruction instruments and equipment for organic debris from a previous procedure. All cannulae are flushed with normal saline and bacitracin solution[8].
- Presence of any organic material requires reprocessing of entire tray and an official "Incident Report[9]."
- Surgeon verifies that all necessary equipment and implants are available and inspected before patient enters room.

Patient Preparation

- Nurse verifies and documents patient compliance with the ACL Clinical Pathway (e.g., no missed appointments and home scrub ×3 with 2% chlorhexidine at 1200 hours the day before surgery, the evening before surgery, and the morning of surgery, with no application of cosmetics, nothing by mouth, etc.).
- Patient's extremity is inspected and skin integrity is verified before being signed by surgeon.
- Removal of hair is performed with electric clippers[10-12].

Day of Surgery and Intraoperative Practices

Nursing

- Room traffic is limited to essential personnel[13-15].
- Students are allowed to observe but not scrub on ACL reconstruction cases.
- Standard extremity preparation
  - Disposable tourniquet[16]
  - Scrub operative extremity with 4% chlorhexidine for ten minutes.
  - Two surgical team members designated to perform the skin preparation first perform a standard surgical hand wash, put on sterile gloves and gown, and use the sterile skin-preparation kit.
  - Two sterile surgical team members are used to hold and scrub the leg.
  - Paint surgical site with two ChloraPrep sticks (Cardinal Health, Dublin, Ohio)[6,17,18].
    - Circulating nurse paints entire leg using the "no-touch" technique, progressing from knee to surrounding areas (e.g., from the clean to the dirty), including the foot.
    - Sterile leg is passed to the surgical technician to hold with a sterile towel, and the paint solution is allowed to dry before draping.

- Impervious stocking and drapes are applied by the surgeon.

- After draping, the surgeon has the option of additional paint with ChloraPrep sticks and antimicrobial sealant (e.g., INTEGUSEAL [Kimberly-Clark Health Care, Roswell, Georgia] and Ioban [3M, St. Paul, Minnesota])[19,20].
- Details of patient skin-preparation (e.g., time of preparation, method, and name of persons responsible) are documented in the medical record.
- Time Out with TeamSTEPPS[21,22]
- Review "Operating Room Checklist for ACL Surgery" with room staff after preparation and throughout case[23,24].

Anesthesia Provider

- Preoperative antibiotics[25,26]
  - Weight-based dosing (mg/kg)[27,28]
  - Infusion coordinated with "Surgical Time-Out" to ensure a preincision infusion of less than thirty minutes for cephalosporin or clindamycin and less than sixty minutes for vancomycin[29,30]
  - Antibiotic redosing after each second half-life[31]
- Maintain normothermia and glycemic control[32-36]

Surgeon

- ACL reconstruction according to departmental consensus of best practice
  - Enforce sterile technique according to established universal precautions.
  - Limit tourniquet time[37].
  - Minimize tissue trauma and surgical time[38].
  - No flash sterilization[39,40].
  - Use disposable equipment and instruments (e.g., tourniquet, reamers, drill-bits, and Beath pins) when possible[41].
  - After each use, all cannulated instruments are flushed with normal saline solution and bacitracin solution[42].
- Graft preparation according to departmental consensus of best practice
  - No nonsterile traffic between preparation area and operating-room table
  - Frequent cleansing of graft in antibiotic solution; protect with antibiotic-soaked sponge until implantation[43]
- After case and before sending ACL reconstruction instruments for decontamination and sterilization, operating-room technician performs the following decontamination procedures[44-49]:
  - Remove all gross contamination.
  - Flush all cannulae with normal saline solution.
  - Treat all equipment with enzymatic spray.

Day of ACL Reconstruction and Postoperative Practices

- ACL Reconstruction Clinical Pathways for early postoperative management
  - Twenty-four-hour Admit Pathway or Same-Day Discharge Home Pathway
- Standard postoperative physical therapy regimen (adapted from Multicenter Orthopaedics Outcomes Network ACL Rehabilitation Guidelines[50])
- No "out of area" travel for first six weeks
- Infection control surveillance of ACL reconstructions according to Centers for Disease Control and Prevention guidelines[2]
- Outcomes monitoring according to American College of Surgeons National Surgical Quality Improvement Program[51]

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