SURGICAL INFECTIONS
Volume 15, Number 2, 2014
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DOI: 10.1089/sur.2012.225

Surgical Site Infections in Genital Reconstruction Surgery for Gender Reassignment, Detroit: 1984–2008

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Abstract

Background: Gender reassignment surgery (i.e., male-to-female or female-to-male) entails a series of complex surgical procedures. We conducted a study to explore epidemiologic characteristics of patients who underwent genital reconstruction operations as components of gender reassignment and to analyze risk factors for surgical-site infections (SSIs) following these operations.
Methods: The study was a retrospective cohort study conducted from 1984–2008 at Harper University Hospital, a tertiary hospital with 625 beds in Detroit, Michigan. Surgical site infection was defined according to established criteria.
Results: Records were available for 82 patients who underwent a total of 1,383 operations as part of genital-reconstruction processes. Thirty-nine (47.6%) of the patients underwent female-to-male reassignment (FTM) and 43 (52.4%) underwent male-to-female reassignment (MTF). The average age of the study cohort was 39.5 ± 9.8 y. Of the patients in the cohort, 56 (68.3%) were Caucasian and 67 (81.7%) were single. The average number of operative encounters per patient was 11.8 ± 4.6 for FTM and 4.9 ± 2.4 for MTF. Forty-three (52.4%) patients developed an SSI at least once during their genital reconstruction process, of whom 34 (87%) were in the FTM group and nine (21%) in the MTF group ($p < 0.001$). Staphylococci were the most common pathogens (61%) isolated in these infections, followed by Enterobacteriaceae (50%), *Enterococcus* (39%), and *Pseudomonas aeruginosa* (33.3%). Surgical site infection was associated independently with an increased frequency of operative procedures and operating room encounters.
Conclusions: More than 50% of patients who underwent genital reconstruction operations developed an SSI at some point during the genital reconstruction process. Surgical site infections are more common in FTM than in MTF reconstruction operations, and for both FTM and MTF, SSIs are associated independently with an increased frequency of total operative procedures and encounters.

Surgical site infections (SSIs) are common healthcare-associated infections, occurring in from 2%–5% of patients undergoing surgery in the United States [1]. Surgical site infections are associated with devastating outcomes, including greater than average morbidity, prolonged length of hospital stay, and higher mortality [1]. These infections will soon have fiscally detrimental consequences, in that as of October 2013, hospitals will no longer be reimbursed by the Centers for Medicare and Medicaid Services for costs associated with SSI [2]. The prevalence of SSIs caused by multi-drug-resistant organisms (MDRO), and particularly by methicillin-resistant *Staphylococcus aureus* (MRSA), is continuing to increase [3].

To be optimally successful, preventive measures for reducing the rate of SSIs should be tailored to the specific type of surgery being performed [4]. Unfortunately, the preventive measures set forth in clinical guidelines are often based on analyses of diverse patient cohorts that undergo a wide range of surgical procedures [4,5]. This is problematic, because effective processes for preventing SSI in one type of surgery may be less effective in other types. Both risk adjustment scores and

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prevention bundles, or collective measures for preventing SSI, should ideally be procedure-specific and based on detailed epidemiologic investigation of specified cohorts of patients who have undergone the same type of procedure [4,6]. This can only be achieved with a proper understanding of the different, specific types of surgery and the risk factors unique to them.

Gender reassignment entails a series of complex surgical procedures performed for the treatment of gender dysphoria (or gender identity disorder) [7]. The surgical procedures required for this can span a period ranging from one year to more than a decade, depending on the extent of feminization or masculinization desired by the patient. Male-to-female (MTF) gender reassignment includes genital procedures such as bilateral orchiectomy, penectomy, labioplasty, clitoroplasty, and vaginoplasty [7]. Non-genital operations include breast augmentation, vocal cord and throat surgery, and facial feminization [7]. Female-to-male (FTM) gender reassignment includes genital operations such as scrotal reconstruction (scrotoplasty including testicular implants), penile reconstruction (metoidioplasty or phalloplasty), hysterectomy, oophorectomy, and vaginectomy, and non-genital operations such as mastectomy [7,8]. Many of the operative procedures for gender reassignment (e.g., hysterectomy, oophorectomy, and vaginectomy) are now accomplished laproscopically [7]. Potential complications of MTF operations are bleeding resulting in labial hematoma, formation of a rectal fistula to the neovagina, and meatal stenosis [7]. Complications of FTM operations include forearm cellulitis, tip necrosis following free-flap phalloplasty, flap loss, neoscrotal abscess, urethral fistula, and urethral stricture [8].

Because it entails multiple operations, and because of the complicated nature of these operations, gender-reassignment surgery carries the risk of SSI. However, the exact rates of SSI in both MTF and in FTM operations are unknown, as are also the unique epidemiologic characteristics associated with SSI following these types of surgery. The present study was done to: (1) Explore the epidemiologic characteristics and outcomes of patients who underwent genital operations for gender reassignment; and (2) identify the frequency of SSI and analyze risk factors for SSIs in this unique patient population.

Patients and Methods

Study settings and design

A specific group of surgeons at Harper University Hospital (HUH) has been conducting gender reassignment operations (predominantly genital reconstruction operations) since 1978. The hospital is a tertiary-care hospital consisting of 625 inpatient beds, and is part of the Detroit Medical Center (DMC) health-care system located in Detroit, Michigan. Gender dysphoria patients from all over the United States and other countries are referred to HUH to undergo these multi-step surgical procedures. A retrospective cohort study was conducted at HUH from 1984–2008 (full documentation was unavailable for the period 1978–1984), based on analysis and review of the charts of patients who underwent genital reconstruction operations. The study was approved by the institutional review boards of both the DMC and Wayne State University.

Patients and clinical variables

Parameters retrieved from patient charts included: (1) Demographic data; 2) chronic co-morbid conditions and scores on the Charlson Comorbidity Index [9]; (3) scores on the American Society of Anesthesiologists (ASA) physical status classification system for assessing the fitness of patients before surgery, and variables related to surgical procedures (e.g., type of surgery performed, number of operating-room encounters, number of procedures performed); and (4) non-SSI-related outcomes including mortality at up to 1 y from the date of the patient's last documented surgery at the study hospital (both medical records and web-based Social Security records were reviewed), and number of admissions. An operating room (OR) encounter was defined as an individual visit to the OR accompanied by an operative note, whereas number of procedures refers to the number of distinct types of operations performed. Therefore, an OR encounter may encompass more than one type of surgical procedure, if multiple procedures were performed during the same OR encounter.

Surgical site infection was defined with established criteria according to the guidelines of the U.S. Centers for Disease Control and Prevention (CDC) [10]. Medical records were reviewed for documentation of purulent drainage, fever, localized pain or tenderness, wound dehiscence, necrosis, or increased swelling and redness occurring within 30 d after the preceding procedure if no prosthesis was implanted, or up to one year after this if a prosthesis was implanted [10]. Medical records were also reviewed to capture a diagnosis of SSI by the surgeon performing a particular procedure. A patient was determined to not have a SSI after available medical records of the DMC for all genital reconstruction operations were reviewed and the patient's condition did not meet the CDC definition of an SSI or was determined by the surgeon as not reflecting a SSI. Only the details pertaining to an initial SSI (if one occurred) were captured, because it was impossible to determine clearly whether a subsequent SSI was a continuation of the first SSI or a new entity. All microbiologic culture data were extracted and reviewed.

Microbiology

The DMC has a single centralized clinical microbiology laboratory that processes about 500,000 samples annually. Bacteria were identified to the species level, and susceptibilities to pre-defined antimicrobial agents were determined on the basis of an automated broth microdilution system (MicroScan, Siemens, Munich, Germany), which the DMC has used since 1995. Before 1995 the DMC had used an analytical profile index (API) system for species identification and susceptibility testing. Throughout the entire period of the present study, all cultures were processed and results interpreted on the basis of the annually published criteria of the Clinical and Laboratory Standards Institute (CLSI) [11].

Statistical analysis

All statistical analyses were done with IBM-SPSS 20 statistical software (SPSS Inc., Chicago, IL). Bivariate analyses were done with the Fisher exact test or the χ^2 test for categorical variables, and the independent samples *t*-test or Mann-Whitney U test for continuous variables. Logistic regression was used for multivariable analyses of epidemiologic features for SSIs in MTF and FTM operations. Parameters were selected for inclusion in the final models through a backward stepwise selection procedure, with a p value threshold for inclusion of ≤ 0.2. If a variable was excluded from the final multivariable model, an odds ratio (OR) and 95% confidence interval (CI) were not calculated for that variable. The final multivariable models were tested for confounding. If a covariate affected the ß-coefficient of a variable in the model by >10%, the confounding variable was kept in the model. All p values were two-sided. Effect modification between variables was evaluated by testing appropriate interaction terms for statistical significance. When effect modification was detected, subgroup analyses were performed.

Results

Eighty-two patients who underwent the series of genital reconstruction operations during the study period had available records sufficient for inclusion in the study. Characteristics of the study population are presented in Table 1.

TABLE 1. EPIDEMIOLOGIC CHARACTERISTICS OF PATIENTS UNDERGOING GENITAL RECONSTRUCTION OPERATIONS FOR GENDER REASSIGNMENT, DETROIT: 1984–2008

Unique patient variables (n=82)	*Female-to-male reassignment* (n=39)	*Male-to-female reassignment* (n=43)
Age (years) (mean ± SD)	39.1 ± 9.9	39.9 ± 9.9
Race		
Caucasian	27 (69.2)	29 (67.4)
African-American	6 (15.4)	13 (30.2)
Marital Status		
Single	29 (74.4)	38 (88.4)
Married	8 (20.5)	2 (4.7)
Divorced	2 (5.1)	3 (7.0)
Height (cm) (mean ± SD)	166.4 ± 6.3	176.8 ± 8.0
Weight (kg) (mean ± SD)	77.4 ± 14.3	80.3 ± 20.4
BMI (mean ± SD)	28.1 ± 5.6	25.7 ± 6.0
Number of procedures (mean ± SD)[a]	21.2 ± 8.6	12.9 ± 6.6
Number of operating-room encounters (mean ± SD)[b]	11.8 ± 4.7	4.9 ± 2.4
ASA score at first admission		
Score 1	2 (5.1)	3 (7.0)
Score 2	36 (92.3)	39 (90.7)
Score 3	1 (2.6)	1 (2.3)
Mean ± SD	2.0 ± 0.3	2.0 ± 0.3
Charlson Comorbidity Index score at first admission (mean ± SD)	0.2 ± 1.0	0.6 ± 1.5
Number of patients with SSI	34 (87.2)	9 (20.9)
Culture of SSI obtained	31 (91.2)	5 (55.6)
Number of cultures confirming SSI	31	5
Coagulase-negative staphylococci	18 (58.1)	2 (40)
Enterococcus faecalis (VSE and VRE)	12 (38.7)	0 (0)
Corynebacterium species	13 (41.9)	1 (20)
Pseudomonas aeruginosa	10 (32.3)	2 (40)
Escherichia coli	10 (32.3)	1 (20)
Enterobacter species	3 (9.7)	0 (0)
Candida species	2 (6.5)	2 (40)
Staphylococcus aureus (MSSA and MRSA)	2 (6.5)	0 (0)
Streptococcus species	2 (6.5)	1 (20)
Stenotrophomonas maltophilia	2 (6.5)	0 (0)
Klebsiella species	2 (6.5)	0 (0)
Citrobacter freundii	1 (3.2)	0 (0)
Enterococcus faecium (VSE and VRE)	1 (3.2)	0 (0)
Enterococcus species	1 (3.2)	1 (20)
Serratia marcescens	1 (3.2)	0 (0)
Culture Site		
Wound	13 (41.9)	3 (60)
Tissue	6 (19.4)	1 (20)
Perineum	5 (16.1)	1 (20)
Penis	3 (9.7)	0 (0)
Groin	4 (12.9)	0 (0)

Data are no. (%) of patients unless otherwise indicated.
[a]Procedure: Surgical intervention performed in the operating room. An operating-room encounter may encompass more than one procedure.
[b]Operating-room encounter: Any visit to the operating room.
ASA score = American Society of Anesthesiologists score; BMI = body mass index (kg/m^2); MRSA = methicillin-resistant *Staphylococcus aureus*; MSSA = methicillin-sensitive *Staphylococcus aureus*; SSI = surgical site infection; VRE = vancomycin-resistant enterococci; VSE = vancomycin-susceptible enterococci.

Overall, the study population consisted of 39 (47.6%) females by birth, who underwent FTM gender reassignment, and 43 (52.4%) males by birth, who underwent MTF gender reassignment. The mean age of the overall study cohort was 39.5 ± 9.8 y. The cohort consisted of 56 (68.3%) Caucasians and 19 (23.2%) African-Americans. Sixty-seven (81.7%) members of the cohort were single, 10 (12.2%) were married, and five (6.1%) were divorced.

The mean number of OR encounters per patient was 11.8 ± 4.7 in the FTM group and 4.9 ± 2.4 in the MTF group. Patients had low scores on the Charlson Comorbidity Index at the time of their initial surgical procedures, with a mean score of 0.2 ± 1.0 in the FTM group and 0.6 ± 1.5 in the MTF group. The mean ASA score was 2 ± 0.3 in both the FTM and MTM groups.

Among the entire cohort, 43 (52.4%) patients developed an SSI at least once during the multi-step process of genital conversion. A SSI was noted in 34 (87.2%) patients in the FTM group and nine (20.9%) patients in the MTF group. This difference in prevalence of SSI between the FTM and MTF groups was statistically significant (odds ratio = 6.9, $p < 0.01$ between groups). The mean number of OR encounters before development of an SSI was 4.7 ± 2.6 in the FTM group and 2.3 ± 1.2 in the MTF group. The mean number of procedures performed on a patient before the development of a SSI was 8.4 ± 6.0 in the FTM group and 7.4 ± 2.6 in the MTF group (Table 2).

Within the group of patients who were noted to have an SSI, cultures were positive (consistent with SSI) for 31 (91.2%) of the patients in the FTM group and five (55.6%) of the patients in the MTF group. Of the organisms isolated, 16 (44.4%) were from wounds, seven (19.4%) from tissue, six (16.7%) from the perineum, three (8.3%) from the penis, and four (11.1%) from the groin. Sites of cultures were recorded as named on the labels on original samples sent to the microbiology laboratory. Within the group of 36 patients who had culture-confirmed SSIs, 22 (61%) had staphylococcal infections (1 MRSA), 18 (50%) had infections with Enterobacteriaceae, 14 (39%) with *Enterococcus* species (three were vancomycin-resistant enterococci [i.e., VRE]), and 12 (33.3%) were *Pseudomonas aeruginosa*. Fourteen (39%) patients had polymicrobial SSIs.

Table 2 shows the predictors and outcomes of SSI among the two groups of patients in the study cohort. The mean number of total OR encounters was significantly associated with the development of a SSI in the FTM group of patients (12.8 ± 3.6, vs. 4.8 ± 5.2 in the FTM group, $p < 0.001$). The mean number of total OR procedures (a single operating-room encounter might have encompassed more than one procedure) was significantly associated with the development of an SSI in the MTF group of patients (16.9 ± 4.3, vs. 11.9 ± 6.7 in the MFT group, $p = 0.04$). There was no association between age, race, marital status, body-mass index (BMI), a high Charlson

Table 2. Bivariate Analysis of Epidemiologic Characteristics Associated with Surgical Site Infection among Patients Undergoing Genital Reconstruction Operations for Gender Reassignment, Detroit: 1984–2008

	Female-to-male reassignment (n = 39)					*Male-to-female reassignment (n = 43)*				
Parameter	*SSI (n = 34)*	*No SSI (n = 5)*	*Odds ratio*	*95% CI*	*p value*	*SSI (n = 9)*	*No SSI (n = 34)*	*Odds ratio*	*95% CI*	*p value*
Demographic characteristics										
Age	38.7 ± 10.2	41.4 ± 7.8	-	-	0.58	34.8 ± 9.4	41.2 ± 9.7	-	-	0.08
Race										
Caucasian	22 (64.7)	5 (100)	[a]	[a]	0.11	4 (44.4)	25 (73.5)	0.29	0.06–1.32	0.10
African-American	6 (17.6)	0 (0)	[a]	[a]	0.31	5 (55.6)	8 (23.5)	4.06	0.88–18.9	0.06
Marital status										
Single (%)	26 (76.5)	3 (60)	2.2	0.31–15.3	0.43	8 (88.9)	30 (88.2)	1.07	0.10–10.9	0.96
Married	6 (17.6)	2 (40)	0.32	0.04–2.36	0.25	1(11.1)	1 (2.9)	4.13	0.23–73.3	0.30
Divorced	2 (5.9)	0 (0)	[a]	[a]	0.58	0 (0)	3 (8.8)	[a]	[a]	0.36
Height (cm)	166.5 ± 6.5	165.48 ± 4.3	-	-	0.76	176.8 ± 5.6	176.8 ± 8.6	-	-	0.99
Weight (kg)	76.5 ± 14.7	84.8 ± 8.9	-	-	0.28	79.5 ± 14.5	80.6 ± 21.9	-	-	0.89
BMI	27.7 ± 5.8	30.9 ± 2.2	-	-	0.28	25.4 ± 4.5	25.7 ± 6.4	-	-	0.89
Severity of chronic conditions on admission for initial surgery										
ASA score ≥2	33 (97)	4 (80)	8.2	0.4–167	0.24	8 (89)	32 (94)	0.5	0.04–6.2	0.51
Charlson Comorbidity Index score ≥2	2 (5.9)	0 (0)	[a]	[a]	>0.99	0	5 (15)	[a]	[a]	0.57
Surgery data										
No. of procedures before SSI[b]	8.4 ± 6.0	-	-	-	-	7.4 ± 2.6	-	-	-	-
No. of operating room encounters before SSI[c]	4.7 ± 2.6	-	-	-	-	2.3 ± 1.2	-	-	-	-
Total no. of procedures[b]	22.9 ± 6.3	9.8 ± 13.6	-	-	0.10	16.9 ± 4.3	11.9 ± 6.7	-	-	0.04
Total no. of operating room encounters[c]	12.8 ± 3.6	4.8 ± 5.2	-	-	<0.001	6.2 ± 2.0	4.6 ± 2.5	-	-	0.07

[a]Odds ratios were not calculated for these parameters because of the presence of a zero value in the 4x4 odds ratios table.
[b]Procedure: Surgical interventions performed in the operating room. An operating room encounter may encompass more than one procedure.
[c]Operating room encounter: Any visit to the operating room.
ASA = American Society of Anesthesiologists; BMI = body mass index; SSI = surgical site infection.

Table 3. Multivariable Model of Risk Factors for Surgical Site Infection Following Female-to-Male Gender-Reassignment Surgery

Covariate	*Odds ratio (95% CI)*	*95% CI*	*p value*
Total number of operating room encounters	1.56 (1.15,2.12)	1.15–2.12	0.005
Total number of procedures			0.51

Comorbidity Index (≥2) or high ASA (≥2) score on admission for initial surgery and the development of a SSI in either the FTM or MTF group.

Multivariable analyses of epidemiologic features associated with SSI in the FTM and MTF groups were performed individually. In the FTM model, presented in Table 3, the parameters considered for inclusion were the total number of an individual patient's OR encounters (visits) and surgical procedures. Because all of the patients in the FTM cohort who did not develop a SSI were Caucasians, this parameter could not have been inserted into the model. A greater frequency of OR encounters was a significant independent predictor of SSI among patients undergoing FTM reassignment (odds ratio = 1.56; 95% CI 1.15–2.12; p = 0.005). The Hosmer-Lemeshow χ^2 value for goodness-of-fit for the FTM model was 11.5 and the significance level was 0.12, indicating that the model was well fitted to the data. The c-statistic for the FTM model was 0.87, indicating that the regression model gave a higher probability of having an SSI to patients with a SSI in 87% of instances.

For the MTF model, presented in Table 4, variables included were number of OR encounters and number of surgical procedures, Caucasian race, and age. A greater number of surgical procedures was a significant independent epidemiologic feature of SSI among patients undergoing MTF reassignment (odds ratio = 1.14; 95% CI 1.01–1.3; p = 0.04). Being Caucasian nearly reached significance as an independent factor associated with decreased risk for SSI among patients undergoing MTF reassignment (odds ratio = 0.22; 95% CI 0.04–1.2; p = 0.08). The Hosmer-Lemeshow χ^2 value for goodness-of-fit for the MTF model was 11.2 and the significance level was 0.19, indicating that the model was well fitted to the data. The c-statistic for the MTF model was 0.80, indicating that the regression model assigned a higher probability of having an SSI to patients with a SSI in 80% of instances.

No patient died within a year of discharge following the patient's last recorded procedure. The mean duration of hospitalization among patients who developed a SSI was not

Table 4. Multivariable Model of Risk Factors for Surgical Site Infection Following Male-to-Female Gender-Reassignment Surgery

Covariate	*Odds ratio (95% CI)*	*95% CI*	*p*
Total number of operating room encounters			0.39
Total number of procedures	1.14	1.01–1.3	0.04
Caucasian race	0.22	0.04–1.2	0.08
Age			0.25

greater than that of patients who did not develop a SSI, in both the FTM group (20.3 ± 12.0 d vs. 13.2 ± 9.5 d, respectively, p = 0.22) and the MTF group (22.8 ± 9.4 d vs. 17.4 ± 6.7 d, respectively, p = 0.57).

Discussion

This study is the first to describe the risk factors and outcomes for development of SSI in gender-dysphoric patients who underwent operations for gender reassignment. Overall, 52.4% of patients experienced at least one SSI. This rate is unexpectedly high as compared with the rates of SSI for other types of "contaminated operations" (e.g., appendectomy following perforation of an appendix), even after considering the number of procedures necessary for gender conversion. Surgical site infection was associated independently with an increased total frequency of OR encounters and total number of procedures. This reflects the role of the number of prior OR encounters or procedures as a risk factor for SSI, and the association between SSI and a subsequently greater frequency of operating-room encounters and surgical procedures, with the greater frequencies of these two variables as outcomes of SSI. Patients undergoing FTM reassignment developed more SSIs than those undergoing MTF reassignment. This makes intuitive sense, in that genital reconstruction in FTM reassignment involves a greater number of procedures than does genital reconstruction in MTF reassignment because of anatomic differences and more extensive use of prostheses and foreign materials.

Despite the predominantly African-American patient population served by the hospital at which the study was done, most of the subjects who underwent gender reassignment in the study were Caucasian. This may reflect differences in socioeconomic status, limited availability of surgeons who perform the specialized surgery for gender reassignment, and cultural differences. Caucasians in the study cohort were less likely than African-Americans to develop SSIs, especially in the MTF group. However, because of the small sample size of the study population, this finding should be interpreted cautiously.

Typical risk factors for SSI, such as a greater-than-normal BMI, abnormal ASA scores, and abnormal co-morbidity indices (e.g., score on the Charlson Comorbidity Index) were not risk factors for SSI in the genital reconstruction operations performed in the present study. This highlights the importance of conducting surgery-specific epidemiologic analyses in developing appropriate interventions and risk-adjustment protocols for preventing SSI. No patients in the study died within 1 y after discharge following each patient's last documented surgery at HUH, which can be expected in that all operations in the study were performed under elective circumstances and in patients at low risk for complications. Nonetheless, SSI resulted in prolongations of hospital stay and additional OR encounters and surgical procedures, with the probable effects of emotional and physical strain on the patient, in addition to increased costs to both the patient and the hospital.

Staphylococci (including one strain of MRSA), Enterobacteriaceae (including five isolates that were resistant to extended-spectrum cephalosporins), enterococci (including three strains of VRE), and *P. aeruginosa* were responsible for most of the culture-proved SSIs in the present study. Antimicrobial prophylaxis for SSI in gender reassignment operations should probably include not only coverage for skin-prevalent organisms (e.g., staphylococci), but also for gram-negative pathogens. The isolation of multi-drug-resistant organisms from patients such as those in the present study, who are usually young and healthy, was a matter of concern, particularly because resistant pathogens causing SSIs have been associated with poor clinical outcomes [1,12–16]. This may reflect multiple procedures and an often prolonged hospital stay, and points strongly to the need for the judicious use of antimicrobial agents for a patient population at risk for SSIs through its need for numerous surgical procedures.

Our study had limitations similar to those of most retrospective analyses. First, the classification of SSI (defined according to established criteria) [1,5,10] was generally based on retrospective chart reviews of signs and symptoms of SSI, as well as on the treating surgeon's discretion in the case of each patient included in the study. In some cases, documentation was not detailed completely. We examined only the initial SSI of each patient in the study because it was impossible to clearly determine whether a subsequent SSI was a continuation of the first SSI or a new entity. Therefore, patients may have had more than one SSI, and the initial report of a SSI might have underestimated the frequency of SSI. We were unable to obtain antimicrobial data pertaining to both pre-operative prophylaxis and treatment because the time frame of our review extended retrospectively over a period of several years. Cultures were not always obtained intra-operatively. Bedside cultures may not always have reflected true pathogens but could have represented colonization. Because of the difficulty in determining retrospectively whether an organism was a pathogen, bacteria were included when applying the definition of SSI, and the clinical judgment of experienced infectious disease specialists was needed to determine whether each positive culture represented a true SSI. Not all patients underwent all stages of the genital surgery for gender reassignment at the study hospital, and a SSI may therefore have occurred outside of the study hospital. Furthermore, because of the retrospective nature of the study and complexity and high frequency of the procedures it included, we could not categorize SSI consistently and effectively as superficial incisional, deep incisional, or organ/space-occupying infections, and therefore did not use these categorizations.

Surgical site infections occur frequently among patients undergoing genital reconstruction operations for gender dysphoria. Ideally, future studies of patients who develop SSIs in undergoing these operations will be performed prospectively, so that these SSIs can be categorized more effectively. Future research should focus on determining the ideal regimen of antimicrobial prophylaxis for patients undergoing these procedures, and on identifying the operative stages associated with the highest risk for SSI. Currently used risk adjustment scores for other types of SSI (e.g., National Nosocomial Infections Surveillance risk index) do not appear to be appropriate for genital reconstruction operations.

Acknowledgments

Keith S. Kaye is supported by the National Institute of Allergy and Infectious Diseases (NIAID) through Division of Microbiology and Infectious Diseases (DMID) Protocol Number 10-0065.

None of the authors has any conflict of interest relevant to this article.

Author Disclosure Statement

No competing financial interests exist.

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