

Database of Surgical Procedures: A Summary of Selected Characteristics of the Surgical Population of the University of Puerto Rico–Affiliated Hospitals

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Objective: To evaluate the age distribution and selected characteristics of the cases recorded in the University of Puerto Rico (UPR) Surgical Database.

Methods: All the surgical cases (from 1/1/2013 to 12/31/2013) in the Surgery Department's database were examined. This database collects patient and procedural information from the surgical services of the UPR-affiliated hospitals (University District Hospital; University Pediatric Hospital; UPR Carolina Hospital; Oncologic Hospital [Dr. I. González Martínez], Pavia Hospital-colorectal service; and Auxilio Mutuo Hospital-colorectal and oncologic services). The patients in the group were subdivided by age (<65 or ≥65 years). The difference between age groups was evaluated using a chi2, t-test, or ANOVA, whichever was appropriate, with a p-value less than 0.05 being considered significant.

Results: Information on 5,263 surgical patients was available for the study period. The mean age was 48 years (±23 years), with 28% of the patients being over 65 years of age. The age group with the highest rate of surgery was that of 61 to 70 years. The gender distribution was found to be similar to that of the general population: 55%, female, and 45%, male. The distribution by surgical service was as follows: general surgery, 32%; colorectal surgery, 21%; oncologic surgery, 22%; and others, 25%. The surgeries were elective in 87% of the cases and emergency procedures in 13% of them. Complications were reported in 3% of the cases; the mortality rate was 1%.

Conclusion: Despite the fact that only 14% of our population was 65 years of age or older, 28% of the patients requiring surgery were in this age group. Older patients now represent a significant proportion of the surgical workload. Our study found that 75% of the surgical procedures performed were in the areas of general, oncologic, and colorectal surgery. [*P R Health Sci J* 2016;35:26-29]

Key words: Surgery, Database, Population aging

Since being able to analyze procedural statistics has become so important in current medical practice, the Department of Surgery of the University of Puerto Rico established a database that collects patient and procedural information. The information collected by databases helps individual physicians make day-to-day decisions on patient care and also facilitates the development of epidemiological models (1).

Our Surgical Database is a confidential database of surgical procedures and their attendant patient-related details; it is compliant with the Health Insurance Portability and Accountability Act (HIPAA). This database contains basic demographic information for each registered patient along with clinical data pertaining to that patient's surgery. Our facility generates a vast amount of surgical information that can be used for epidemiological and procedural studies. In the past this information was not collected in a uniform manner so that it could be accessed for future research.

The purpose of this study was to report the information obtained on surgical procedures and to report, as well, the outcomes during the first year of the Surgical Database. In this

first report, we have decided to address the age distribution and selected characteristics of the surgical population of the University of Puerto Rico–affiliated hospitals. This report will compare the outcomes of patients who were younger than 65 years of age with those of the patients who were 65 and older and also review the surgical services for which there is the greatest demand in our population.

Methods

We identified all the surgical cases entered, from January 1, 2013, to December 31, 2013, into the Surgical Database of the Department of Surgery of the University of Puerto Rico (UPR).

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The authors have no conflict of interest to disclose.

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This database collects patient and procedural information from the surgical services of the UPR-affiliated hospitals (University District Hospital; University Pediatric Hospital; UPR Carolina Hospital; Oncologic Hospital [Dr. I. González Martínez], Pavia Hospital-colorectal service; and Auxilio Mutuo Hospital, the colorectal and oncologic services. The data were (and continue to be) obtained from the regular weekly reports, generated by residents, of the various surgical services at the participating hospitals. The pertinent details about the surgical procedures that were performed are extracted from the weekly reports and aggregated into the database. Personal identifiers are not included in the aggregated data. The database includes the following variables from each patient: age and gender, the surgical service used, outpatient/inpatient status, the diagnosis, the international classification of disease (ICD) code, the surgical procedure performed, the current procedural terminology (CPT) code, whether the surgery performed was an elective or emergency procedure, wound classification, and the outcome. For the purposes of the database, the variable "outcome" has 4 possible choices: uneventful, minor morbidity, major morbidity, and mortality. A minor morbidity is defined in the database as a superficial wound infection, superficial wound disruption, small seroma, small hematoma, or postoperative ileus. A major morbidity is any postoperative complication requiring medical/surgical attention and that is not included in the minor morbidity category.

The characteristics of the surgical population as a whole were evaluated during the 1-year study period. The group was subdivided into patients younger than 65 and those who were 65 and older, to evaluate whether the older patients responded differently to surgical management. All the variables studied were tabulated for the 2 subgroups and the values compared. Outcomes were also evaluated by gender.

Statistical analyses were performed with the software program SPSS, version 22.0 (Chicago, Illinois). Categorical variables were presented as frequencies and percentages. Quantitative variables were expressed as means plus or minus standard deviation. The study groups were compared using the chi-square test, Student's t-test, or ANOVA, whichever was appropriate. Differences between groups were considered to be statistically significant when the p-value was less than 0.05.

This database was reviewed and approved by the Institutional Review Board (IRB) of the University of Puerto Rico Medical Sciences Campus.

Results

During the 1-year period of our study, the Surgical Database collected information on 5,263 surgical cases. The mean age of this group was 48 (± 23) years; the median age was 53 years. We found that 28% of the surgical population was 65 years of age or older and that the individuals with the highest rates of surgery were those in the 61- to 70-year-old age group (Figure 1). Regarding the gender distribution of the surgical population, it

was found to be similar to that of the distribution of the general population: 55%, female, and 45%, male.

The highest demands for surgical services occurred in general surgery (32%), oncologic surgery (22%), and colorectal surgery (21%) (Table 1). Wound classification was reported as clean in 51.5% of the patients, clean-contaminated in 32.5%, contaminated in 8.6%, and dirty or infected in 5.6%. Our study indicated that 39% of the surgeries were performed on an outpatient basis. The majority of the cases were classified as elective (86.5%) and without complications (uneventful) (96.9%). Complications were reported in only 3% of the cases and mortality was reported in only 1%.

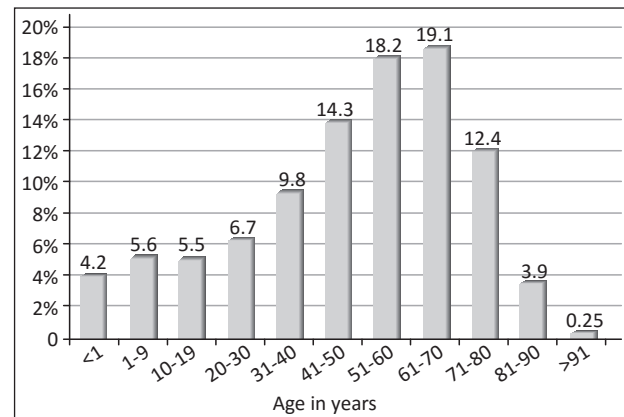


Figure 1. Age distribution of the surgical population of the University of Puerto Rico-affiliated hospitals (n = 5,263)

When the group was divided by age group, those who were younger than 65 years of age and those who were 65 or older, a few differences were found. A slightly higher mortality from surgical procedures was noted in patients belonging to the older group (1.0%), compared to the younger one (0.3%); this was statistically significant ($p < 0.05$), as can be seen in Table 2. The percentage of older patients was higher in the oncologic surgery service (37%) and the vascular surgery service (56%) than it was in the general surgery service (25%) (Table 1). When the mean ages (years) of the oncologic (58 ± 15) and vascular surgery patients (63 ± 16) were compared to the mean age of the general surgery patients (50 ± 19), we found that the patients in the former 2 groups were significantly older than those in the latter ($p < 0.05$).

Differences by gender are shown in Table 2, with males having a slightly higher major surgical morbidity (2% vs. 1%; $p < 0.05$).

Discussion

The median age of our clinical population was 53 years, while the median age of the general population of Puerto Rico is 37 years, according to the United States Census Bureau (2). Our study found that 28% of the surgical population was in the 65-and-over age group, meaning that this age group's presence in the surgical population is twice that of its presence in the general population (2). The United States and Puerto Rico are both experiencing major demographic shifts. In the coming

Table 1. Characteristics of the surgical population of the University of Puerto Rico–affiliated hospitals and comparisons by age (December 1, 2013 – December 31, 2013) (n = 5,263).

Variables (n = 5263)	Frequency n (%)	Age (years) mean ± SD	P value ^A	Age (n, %)*		P value ^B
				<65 years (n = 3,797, 72%)	≥65 years (n = 1,460, 28%)	
<i>Gender**</i>						
Male	2381 (45%)	46 ± 25	<0.05	1731 (73%)	650 (27%)	0.52
Female	2870 (55%)	50 ± 22		2059 (72%)	805 (28%)	
<i>Surgery services***</i>						
Cardiothoracic	286 (5.4%)	53 ± 22	<0.05	200 (70%)	86 (30%)	0.37
Colorectal	1126 (21.4%)	55 ± 17		757 (67%)	367 (33%)	<0.05
General	1655 (31.5%)	50 ± 19		1249 (75%)	406 (25%)	<0.05
Oncologic	1151 (21.9%)	58 ± 15		720 (63%)	430 (37%)	<0.05
Pediatric	625 (11.9%)	5 ± 6		625 (100%)	0	--
Plastic	140 (2.7%)	48 ± 17		112 (81%)	27 (19%)	<0.05
Vascular	217 (4.1%)	63 ± 16		94 (44%)	122 (56%)	<0.05
Hepatobiliary	60 (1.1%)	62 ± 14		38 (64%)	21 (36%)	0.18
<i>Admission status§</i>						
Inpatient	3186 (60.6%)	47 ± 25	<0.05	2290 (72%)	891 (28%)	0.59
Outpatient	2072 (39.4%)	50 ± 20		1505 (73%)	566 (27%)	
<i>Wound classification‡</i>						
Clean	2673 (51.5%)	49 ± 23	<0.05	1888 (71%)	783 (29%)	<0.05
Clean-contaminated	1686 (32.5%)	46 ± 24		1243 (74%)	441 (26%)	0.11
Contaminated	448 (8.6%)	45 ± 24		343 (77%)	104 (23%)	<0.05
Dirty/infected	289 (5.6%)	51 ± 22		210 (73%)	78 (27%)	0.83
Other	85 (1.6%)	57 ± 15		60 (71%)	25 (29%)	0.71
N/A	6 (0.11%)	45 ± 21		6 (100%)	0	--
<i>Outcome†</i>						
Uneventful	2860 (96.8%)	48 ± 23	0.01	2090 (73%)	764 (27%)	0.42
Minor morbidity	39 (1.3%)	50 ± 22		27 (69%)	12 (31%)	0.58
Major Morbidity	42 (1.4%)	39 ± 29		33 (79%)	9 (21%)	0.42
Mortality	14 (0.5%)	59 ± 30		6 (43%)	8 (57%)	<0.05
<i>Surgery type††</i>						
Elective	1460 (86.5%)	50 ± 23	<0.05	1029 (71%)	425 (29%)	<0.05
Emergency	227 (13.5%)	35 ± 26		192 (85%)	35 (15%)	

^AStudent's t-test or ANOVA for p-value. ^BChi-square test for p-value. *The comparisons are not registered in all the surgeries; **Registered in 5251 surgeries; ***Registered in 5260 surgeries; §Registered in 5258 surgeries; ‡Not registered in 76 surgeries; †Registered in 2955 surgeries; ††Registered in 1687 surgeries. When comparing the 2 age groups (<65 vs. ≥65), the different surgical services, wound classifications, and outcomes are treated as different variables (yes/no), and this is why each one has one p-value.

decades, people aged 65 and over will make up an increasingly large percentage of the population (2–4). This shift is happening for 2 reasons: people are living longer, and many couples are choosing to have fewer children (decreasing birth rate). There is also the contribution consisting of baby boomers who are reaching their golden years. Older patients now represent a significant proportion of the surgical workload, with the greater delivery of care that this group requires (5–6). Elderly patients are vulnerable, especially in the postoperative period, because of the physiological changes of aging and this population's (generally) limited physiological reserves in terms of being able to tolerate the stress of a surgical procedure.

Despite the growth of the elderly population, most surgical training programs lack formalized geriatric education. It has been suggested that we should develop and implement a formalized geriatric surgery curriculum for general surgery residents (7–10). Geriatric patients have specific medical and social needs that surgeons must learn to take into consideration. Validated

scales are currently available to evaluate preoperative variables predictive of poor surgical outcomes, which scales include the Hopkins Frailty Score (11), the Preoperative Comprehensive Geriatric Assessment (12–13), and the Aging Frailty Index (14). Through the use of these scales, surgeons can determine who is too frail for surgery.

Our study also found that 75% of the demand for surgical services occurs in the areas of general, oncologic, and colorectal surgery. Again, this is consistent with the literature reports showing these services to be the most used by elderly populations (15–16). In particular, cancer surgery is very frequent in the elderly (15–16). Nonetheless, this general surgery database does not collect data from the orthopedic, urology, or ophthalmology services, all of which are also known to be in high demand among the elderly.

Meanwhile, currently, 39% of our surgeries are performed on an outpatient basis, which is slightly lower than the average of 54%, which is reported for the United States (17).

Subdividing the group into those who are younger than 65 and those who are 65 years of age and older allowed us to compare how the variables in the database differ for the 2 age groups. Elderly patients have a slightly higher mortality rate from surgical procedures (1.0% vs. 0.3%), which is statistically significant (p<0.05). The oncologic (37%) and vascular (57%) surgery services have the highest percentages of elderly patients, similar to what has been reported in the literature (15,16,18).

Our study showed that we have low complication (3%) and mortality rates (1%). It has been reported that in the United States, the overall 30-day mortality after surgery is between 1.9 and 2.1%, and that surgical complications occur in 12% of the cases (19–20). However, as the number of elderly patients increases, we could face higher morbidity and mortality rates. As populations continue to age, health care providers must meet the challenge of providing appropriate surgical care for the elderly.

Table 2. Postoperative mortality and morbidity (by age and gender) of the surgical population of the University of Puerto Rico–affiliated hospitals (December 1, 2013 – December 31, 2013) (n = ?).

Outcome	Age Group (n, %)		P Value	Gender (n, %)		P Value
	<65 years n = 2,156	≥65 years n = 793		Male n = 1333	Female n = 1611	
Mortality	6 (0.3%)	8 (1.0%)	<0.05	7 (0.5%)	6 (0.4%)	0.59
Major morbidity	33 (1.5%)	9 (1.1%)	0.42	26 (2.0%)	16 (1.0%)	<0.05
Minor morbidity	27 (1.3%)	12 (1.5%)	0.58	23 (1.7%)	16 (1.0%)	0.11
Uneventful	2090 (96.9%)	764 (96.3%)	0.42	1277 (95.8%)	1573 (97.6%)	<0.05

Chi-square test used for p-value. Outcome by age was registered for 2949 cases and by gender for 2944 cases

With regard to the study's limitations, it is important to realize that our database obtains information from the UPR-affiliated hospitals and from selected services of the participating private hospitals; therefore, our database does not represent the general population of PR. Nonetheless, this database will facilitate research into and about surgical outcomes and may be used to study the patterns of regional practices.

Resumen

Objetivo: Evaluar distribución por edad y características de casos quirúrgicos en la Base de Datos de la Universidad de Puerto Rico (UPR). **Metodos:** Examinamos todos los casos quirúrgicos entrados a la Base de Datos entre 1/1/2013 y 12/31/2013. Esta base de datos contiene información sobre los casos quirúrgicos realizados por los hospitales afiliados a la UPR (Hospital de Distrito Universitario, Hospital Universitario Pediátrico, Carolina-UPR, Oncológico, Pavía-Colorectal, Auxilio Mutuo-Colorectal/Oncológico). El grupo se subdividió por edad entre los <65 y los ≥65 años. Evaluamos diferencias entre grupos con la prueba Chi2, prueba t, o ANOVA, consideramos $p < 0.05$ estadísticamente significativo. **Resultados:** Durante el período del estudio se realizaron 5,263 casos quirúrgicos. La edad media fue de 48 ± 23 años y 28% del grupo tenía 65 años o más. El intervalo más grande fue el de 61 a 70 años. La distribución por género fue similar a la poblacional: 55% mujeres y 45% hombres. La distribución por especialidades fue 32% cirugía general, 21% cirugía colorectal, 22% cirugía oncológica y 25% otras. Las cirugías fueron electivas en 87% y emergencias en 13%. Se reportaron complicaciones en 3% de los casos y la mortalidad fue de 1%. **Conclusion:** A pesar de que solamente 14% de la población general es de 65 años o más, la población quirúrgica tiene un 28% de casos en esa categoría de edad. Los pacientes de edad avanzada representan una porción significativa del trabajo de los servicios de cirugía. Encontramos que cirugía general, cirugía colorectal y cirugía oncológica prestan 75% del total de los servicios quirúrgicos.

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