

Increasing Proportion of Elderly Patients that make use of the Surgery Services of the UPR-affiliated Hospitals

Norma I. Cruz, MD; Elvis Santiago, MS; Valerie Cabrera, MD

Objective: To evaluate how the proportion of elderly patients aged 65 and above has increased in our surgical services over a 5-year period.

Methods: We compared the ages and characteristics of the surgical cases in 2014 with those in 2019, a 5-year interval, using the information from the University of Puerto Rico (UPR) General Surgery Database. The variables examined included age, gender, American Society of Anesthesiology (ASA) classification and outcome.

Results: In the UPR General Surgery Database information was available for 4,906 surgical cases performed in 2014 and for 4,954 such cases performed in 2019. The mean age of the patients increased from 48 (± 23) years to 50 (± 22) years in the 5-year interval. The gender distribution indicated that 56% were women and 44% were men, with no significant difference between the 2 periods evaluated. A statistically significant ($P < 0.001$) increase in patients, 65 years of age and older occurred from 2014 (27%) to 2019 (31%). Patients aged 65 years and older were sicker, as indicated by more frequent ASA classifications of 3 or greater (in 2014: 13% vs. 32% and in 2019: 31% vs. 59%; $P < 0.001$). Postoperative morbidity and/or mortality were slightly higher in the older group (5%, 3%) when compared to the younger group (3%, 2%).

Conclusion: Elderly patients represent about one-third of the surgical workload, a proportion that is expected to grow as the general population ages. The rapid aging of the population presents important challenges, such as shifting disease burden and increased expenditures on health and the long-term care of the elderly, for which we will have to prepare. [*P R Health Sci J* 2022;41(4):243-246]

Key words: Aging, Elderly, Surgery

The proportion of elderly people (those 65 years of age and older) is increasing in Puerto Rico and in the world (1). In our region, the elderly accounted for 15% of the population in 2014, which percentage increased to 20% in 2019 (2). The proportion of elderly people in Puerto Rico was higher than that reported by the United States (12% for 2014 and 17% for 2019) for the same years (3). Our numbers are starting to get closer to those of Japan, which is considered the front-runner in terms of the proportion of elderly population, reporting 25% for 2014 and 28% for 2019 (4-6). The trends toward general population aging and declining birth rates are taking a toll on healthcare services (7-8). Older individuals require more medical and surgical services relative to their younger counterparts and the costs are higher for those services (9-15). To meet the challenge of providing healthcare to the elderly we have to start evaluating our demographic changes and how they correlate with the increased demand for services.

Methods

We compared the ages and characteristics of the surgical cases in 2014 with those in 2019, a 5-year interval, using

the information from the University of Puerto Rico (UPR) General Surgery Database. The demographic information and clinical data of the patients who have had surgery at the UPR-affiliated hospitals are stored within this database, which holds information collected from surgical services of 6 UPR-affiliated hospitals, 4 of which are community hospitals and 2 of which are academic centers. This database, previously described in 2018 (16), obtains the information from the weekly reports submitted by the residents of the different surgical services at the participating hospitals. The reports include surgical procedures performed, outcome and patient characteristics. The database collects for each patient the age, gender, American Society of Anesthesiologists (ASA) physical status classification; the surgical procedure(s), and outcome. Personal identifiers

Department of Surgery, School of Medicine, University of Puerto Rico Medical Sciences Campus, San Juan, Puerto Rico

The authors have no conflicts of interest to disclose.

Address correspondence to: Norma I. Cruz, MD, Department of Surgery, School of Medicine, University of Puerto Rico, PO Box 365067, San Juan, PR 00936-5067. Email: normacruz001@gmail.com

are not included in the aggregated data. The database is secure, confidential and compliant with the Health Insurance Portability and Accountability Act (HIPAA).

For our study we selected a limited data set that included the age, gender, ASA classification and surgical outcome of every case performed during the years studied (2014 and 2019).

Statistical analyses were performed with the software program SPSS (IBM Corp. Released 2013. IBM SPSS Statistics for Windows, version 22.0. Armonk, NY: IBM Corp). Quantitative variables were expressed as means plus or minus standard deviations. Categorical variables were presented as frequencies and percentages. An analysis of variance (ANOVA) was used to compare quantitative variables among the groups. Differences among the proportions were compared using a chi-squared test. Results were considered significant when the *P*-value was less than .05.

This study was approved by the Institutional Review Board of the UPR Medical Sciences Campus.

Results

The UPR General Surgery Database collected the information of 4,906 surgical cases in 2014 and of 4,954 surgical cases in 2019. The mean age of the patients increased from 48 (± 23) years to 50 (± 2) years in the 5-year interval. Figure 1 shows that the average age of surgical patients at the identified UPR-affiliated hospitals is increasing. The gender distribution indicated that 56% of said patients were women and 44% were men, with no significant difference between the 2 periods evaluated. We found that the percentage of elderly patients (≥ 65 years) increased from 27% in 2014 to 31% in 2019, a difference that was statistically significant (Table 1).

Patients 65 years of age and older were sicker in 2019 than in 2014, as indicated by the assigning of an ASA classification equal to or greater than 3 in a significantly higher number of 2019 patient. Postoperative morbidity and mortality were slightly

greater in the older group when compared to the younger group for each year evaluated (Table 1).

Discussion

The proportion of elderly people in Puerto Rico has been experiencing a steady increase since 1960 as indicated by the U.S. Census Bureau (1) and the World Bank (2). During the 5-year period (2014-2019) of our study, the percentage of adults in Puerto Rico 65 years and older increased from 15% to 20% (2). This demographic trend is not limited to Puerto Rico, since worldwide the elderly population group is growing faster than is the younger group (3-5).

Our study indicated that older adults (≥ 65 years) accounted for 31% of the surgical workload at the UPR-affiliated hospital in 2019. This proportion was higher than that reported for this age group in the general population of Puerto Rico (20%) for the same year.

The ASA physical status classification, used as a measure of preoperative health status, indicated that older patients seemed to have severe systemic disease (ASA of ≥ 3) significantly more frequently than their younger counterparts did. In addition, the aging population is more likely to have chronic diseases, such as diabetes and hypertension (17). Such conditions increase the rate of surgical complications, length of hospital stay and general cost of care. Our study also indicated a slightly higher rate of postoperative complications in the older group when compared with the younger group. However, surgical advances and better postoperative care, in later years, make it difficult to compare outcomes between 2014 and 2019, showing a slight decrease in eventful outcomes in the elderly group in more recent years (5% in 2014 vs. 3% in 2019) despite having higher ASA scores.

People 65 years of age and older have surgery more often than do the members of any other age group (8) and, in addition to its link to the increased risk of surgery, age is an independent

predictor of adverse postoperative outcomes and high resource use (18-20).

Providing care for the elderly poses an economic burden for healthcare systems, particularly when independent living (for the elderly patient) is no longer possible. Identifying care pathways that are cost-effective and that pay attention to quality of life have become challenging. Surgery in the elderly has to acknowledge the associated risks and clearly identify meaningful outcomes (10). Issues in the areas of informed consent, the intensity and duration of treatment and, the ethics of end-of-life care have to be resolved (21-22). Recent efforts to understand differences in priorities for care at various ages and to incorporate palliative care

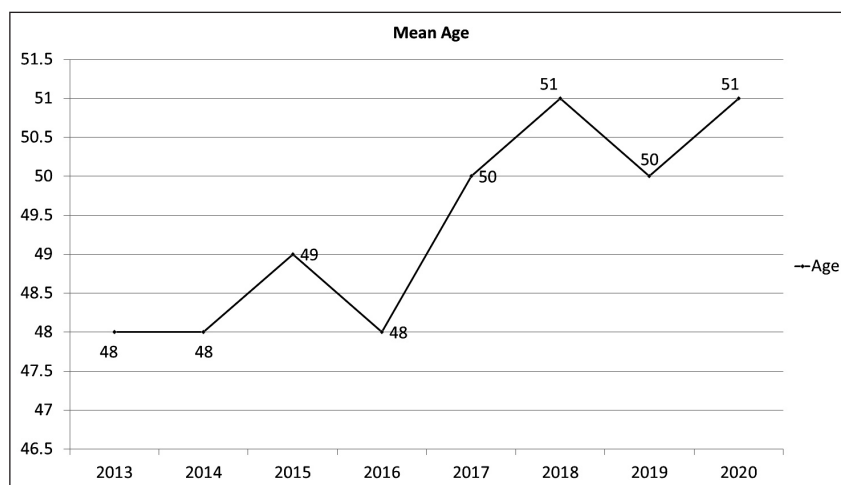


Figure 1. Mean age of surgical patients from 2013 through 2020 (from the UPR General Surgery Database).

Table 1. Number of patients and their characteristics by age groups (<65 and ≥65) during the 2 years evaluated. Differences between proportions were compared using the chi-squared test.

	Year 2014 n=4,906		Year 2019 n=4,954		p
	Age < 65 years	Age ≥ 65 years	Age < 65 years	Age ≥ 65 years	
Number of cases	3,579 (73%)	1,327 (27%)	3,445 (69%)	1,509 (31%)	<.001
Males	1,582 (45%)	589 (45%)	1,467 (43%)	682 (45%)	.27
Females	1,974 (56%)	736 (56%)	1,957 (53%)	824 (55%)	
ASA <3	2,461 (87%)	746 (68%)	2,253 (69%)	584 (41%)	<.001
ASA ≥3	366 (13%)	346 (32%)	1007 (31%)	839 (59%)	
Eventful outcome (morbidity & mortality)	97 (3%)	63 (5%)	82 (2%)	40 (3%)	.004

perspectives into surgical decision making have changed the approach to managing older patients.

Among the limitations of our study is that the UPR General Surgery Database, which we used for this work, obtains information only the UPR-affiliated hospitals in Puerto Rico, a total of 6 participating hospitals (2 academic centers and 4 community hospitals). These data do not comprehensively represent our general population. Nonetheless, this study suggests that the proportion of elderly patients that make use of surgery services is growing.

As the elderly population in Puerto Rico continues to increase, this demographic change poses distinct challenges for the current health policy personnel who are engaged in efforts to define the appropriate role of surgical intervention within an aging population.

Conclusion

In 2019, patients aged 65 years and older constituted 31% of the surgical workload of the UPR-affiliated hospitals, a proportion that is expected to increase over the next years. The aging of populations presents a number of challenges; including shifting disease burden, and increased expenditure on health and long-term care. We need to prepare our healthcare system for the important population changes ahead.

Resumen

Objetivo: Evaluar como la proporción de envejecientes, edad 65 o más, ha aumentado en nuestros servicios quirúrgicos en un período de 5 años. **Método:** Comparamos las edades y características de los pacientes quirúrgicos en el 2014 con los del 2019, un intervalo de 5 años. Usamos la información en el Banco de Datos de Cirugía General de la UPR. Las variables examinadas incluyeron la edad, el género, la clasificación de la Sociedad Americana de Anestesiología (ASA, por sus siglas en inglés) y el resultado de la cirugía. **Resultados:** En el Banco de Datos de Cirugía General de la UPR encontramos que se realizaron 4,906 casos quirúrgicos en el 2014 y 4,954 casos en el 2019. En 5 años, la edad media de los pacientes aumentó de 48±23 a 50±22 años. La distribución por género indicó

que 56% fueron mujeres y 44% fueron hombres, sin diferencia significativa entre los 2 periodos evaluados. Un aumento estadísticamente significativo ($P<0.001$) se encontró en la cantidad de pacientes ≥65 años entre el 2014 (27%) y el 2019 (31%). Los pacientes con 65 años o más estaban más enfermos según indica la mayor frecuencia de clasificaciones ASA de ≥3 (en el 2014: 13% vs. 32% y en el 2019: 31% vs. 59%; $P<0.001$). Un resultado con complicaciones/mortalidad fue más frecuente en los viejos (5%, 3%) que en los jóvenes (3%, 2%). **Conclusión:** Los viejos representaron una tercera parte de la labor quirúrgica, un porcentaje que aumentará. El rápido envejecimiento poblacional presenta serios retos; tipos de condiciones, mayor costo y cuidado a largo plazo, para lo cual nos tenemos que preparar.

References

1. U.S. Census Bureau. QuickFacts: Puerto Rico. U.S. Census Bureau. Accessed March 22, 2021. <https://www.census.gov/quickfacts/PR>
2. The World Bank. Population ages 65 and above (% of total population) – Puerto Rico. The World Bank - Data. Updated 2019. Accessed March 22, 2021. <https://data.worldbank.org/indicator/SP.POP.65UP.TO.ZS?locations=PR>
3. The World Bank. Population ages 65 and above (% of total population) – United States. The World Bank – Data. Accessed March 22, 2021. <https://data.worldbank.org/indicator/SP.POP.65UPTO.ZS?locations=US>
4. The World Bank. Population ages 65 and above (% of total population) – Japan. The World Bank – Data. Accessed March 22, 2021. <https://data.worldbank.org/indicator/SP.POP.65SUP.TO.ZS?locations=JP>
5. Arai H, Ouchi Y, Toba K, et al. Japan as the front-runner of super-aged societies: Perspectives from medicine and medical care in Japan. *Geriatr Gerontol Int.* 2015;15(6):673-687. doi:10.1111/ggi.12450
6. Sudo K, Kobayashi J, Noda S, Fukuda Y, Takahashi K. Japan's healthcare policy for the elderly through the concepts of self-help (Ji-jo), mutual aid (Go-jo), social solidarity care (Kyo-jo), and governmental care (Ko-jo). *Biosci Trends.* 2018;12(1):7-11. doi:10.5582/bst.2017.01271
7. Søreide K, Wijnhoven BP. Surgery for an ageing population. *Br J Surg.* 2016;103(2):e7-e9. doi:10.1002/bjs.10071
8. Etzioni DA, Liu JH, Maggard MA, Ko CY. The aging population and its impact on the surgery workforce. *Ann Surg.* 2003;238(2):170-177. doi:10.1097/01.SLA.0000081085.98792.3d
9. Bloom DE, Chatterji S, Kowal P, et al. Macroeconomic implications of population ageing and selected policy responses. *Lancet.* 2015;385(9968):649-657. doi:10.1016/S0140-6736(14)61464-1
10. Deiner S, Westlake B, Dutton RP. Patterns of surgical care and complications in elderly adults. *J Am Geriatr Soc.* 2014;62(5):829-835. doi:10.1111/jgs.12794
11. Oksuzyan A, Jeune B, Juel K, Vaupel JW, Christensen K. Changes in hospitalisation and surgical procedures among the oldest-old: a follow-up study of the entire Danish 1895 and 1905 cohorts from ages 85 to 99 years. *Age Ageing.* 2013;42(4):476-481. doi:10.1093/ageing/aff031
12. Gale SC, Shafi S, Dombrowski VY, Arumugam D, Crystal JS. The public health burden of emergency general surgery in the United States: A 10-year analysis of the Nationwide Inpatient Sample—2001 to 2010. *J Trauma Acute Care Surg.* 2014;77(2):202-208. doi:10.1097/TA.0000000000000362
13. Havens JM, Olufajo OA, Cooper ZR, Haider AH, Shah AA, Salim A. Defining Rates and Risk Factors for Readmissions Following Emergency General Surgery [published correction appears in *JAMA Surg.* 2017 Jul

- 1;152(7):708]. *JAMA Surg.* 2016;151(4):330-336. doi:10.1001/jama-surg.2015.4056
14. Ogola GO, Gale SC, Haider A, Shafi S. The financial burden of emergency general surgery: National estimates 2010 to 2060. *J Trauma Acute Care Surg.* 2015;79(3):444-448. doi:10.1097/TA.0000000000000787
15. Tay HS, Wood AD, Carter B, et al. Impact of Surgery on Older Patients Hospitalized With an Acute Abdomen: Findings From the Older Persons Surgical Outcome Collaborative. *Front Surg.* 2020;7:583653. Published 2020 Nov 16. doi:10.3389/fsurg.2020.583653
16. Cruz NI, Lopez LA, Santiago E. Body Mass Index and Surgical Outcome in a Puerto Rican Population. *P R Health Sci J.* 2018;37(3):165-169.
17. Pérez C, Ailshire JA. Aging in Puerto Rico: A Comparison of Health Status Among Island Puerto Rican and Mainland U.S. Older Adults. *J Aging Health.* 2017;29(6):1056-1078. doi:10.1177/0898264317714144
18. Hamel MB, Henderson WG, Khuri SF, Daley J. Surgical outcomes for patients aged 80 and older: morbidity and mortality from major noncardiac surgery. *J Am Geriatr Soc.* 2005;53(3):424-429. doi:10.1111/j.1532-5415.2005.53159.x
19. Turrentine FE, Wang H, Simpson VB, Jones RS. Surgical risk factors, morbidity, and mortality in elderly patients. *J Am Coll Surg.* 2006;203(6):865-877. doi:10.1016/j.jamcollsurg.2006.08.026
20. Ingraham AM, Cohen ME, Raval MV, Ko CY, Nathens AB. Variation in quality of care after emergency general surgery procedures in the elderly. *J Am Coll Surg.* 2011;212(6):1039-1048. doi:10.1016/j.jamcollsurg.2011.03.001
21. McIsaac DI, Moloo H, Bryson GL, van Walraven C. The Association of Frailty With Outcomes and Resource Use After Emergency General Surgery: A Population-Based Cohort Study. *Anesth Analg.* 2017;124(5):1653-1661. doi:10.1213/ANE.0000000000001960
22. Terranova C, Cardin F, Pietra LD, Zen M, Bruttocao A, Militello C. Ethical and medico-legal implications of capacity of patients in geriatric surgery. *Med Sci Law.* 2013;53(3):166-171. doi:10.1177/0025802412473963
-