Racial variation in the use of life-sustaining treatments among patients who die after major elective surgery

Citation

Hernandez, Roland A., Nathanael D. Hevelone, Lenny Lopez, Samuel R.G. Finlayson, Eva Chittenden, and Zara Cooper. 2015. "Racial Variation in the Use of Life-Sustaining Treatments Among Patients Who Die after Major Elective Surgery." *The American Journal of Surgery* 210 (1) (July): 52–58. doi:10.1016/j.amjsurg.2014.08.025.

Published Version

doi:10.1016/j.amjsurg.2014.08.025

Permanent link

<http://nrs.harvard.edu/urn-3:HUL.InstRepos:32784872>

Terms of Use

This article was downloaded from Harvard University's DASH repository, and is made available under the terms and conditions applicable to Open Access Policy Articles, as set forth at <http://nrs.harvard.edu/urn-3:HUL.InstRepos:dash.current.terms-of-use#OAP>

Share Your Story

The Harvard community has made this article openly available.
Please share how this access benefits you. [Submit a story](#).

[Accessibility](#)

Published in final edited form as:

Am J Surg. 2015 July ; 210(1): 52–58. doi:10.1016/j.amjsurg.2014.08.025.

Racial Variation in the Use of Life-Sustaining Treatments among Patients Who Die After Major Elective Surgery

Roland A. Hernandez, MD, JD, MPH^{a,b}, Nathanael D. Hevelone, MPH^a, Lenny Lopez, MD, MPH, MDiv^c, Samuel R.G. Finlayson, MD, MPH, FACS^d, Eva Chittenden, MD^e, and Zara Cooper, MD, MSc, FACS^{a,f}

^aCenter for Surgery and Public Health, Brigham and Women's Hospital, Boston, MA

^bDepartment of Surgery, Dartmouth-Hitchcock Medical Center, Lebanon, NH

^cMongan Institute for Health Policy, and Disparities Solutions Center, Massachusetts General Hospital. Department of General Medicine, Massachusetts General Hospital and Brigham and Women's Hospital, Boston, MA

^dDepartment of Surgery, University of Utah School of Medicine, Salt Lake City, UT

^eDivision of Pain and Palliative Medicine, Massachusetts General Hospital, Boston, MA

^fDivision of Trauma, Burns, and Surgical Critical Care, Brigham and Women's Hospital, Boston, MA

Abstract

Background—Although various studies have documented increased Life-Sustaining Treatments (LST) among racial minorities in medical patients, whether similar disparities exist in surgical patients is unknown.

Methods—Retrospective cohort study using the Nationwide Inpatient Sample (2006–2011) examining patients >39 years who died following elective colectomy. Primary predictor variable was race and main outcome was use of LST.

Results—In univariate analysis, significant differences existed in use of CPR (Black-35.9%, Hispanic-29.0%, Other-24.5%, White-11.7%, $p = 0.002$) and re-intubation (Hispanic-75.0%, Other-69.0%, Black-52.3%, White-45.2%, $p = 0.01$). In multivariate analysis, Black (OR3.67, $p=0.01$) and Hispanic (4.21, $p=0.03$) patients were more likely to have undergone CPR, and Hispanic patients (4.24, $p=0.01$) were more likely to have been re-intubated (reference: White).

Conclusions—Blacks and Hispanics had increased odds of experiencing CPR, and Hispanics were more likely to have been re-intubated before death following a major elective operation. These variations may imply worse quality of death and increased associated costs.

Corresponding Author: Zara R. Cooper, MD, MSc, FACS, Assistant Professor of Surgery, Brigham and Women's Hospital, Trauma, Burn & Surgical Critical Care, 75 Francis Street, Boston, MA 02115, Tel. 617-732-7715, Fax. 617-566-9549, zcooper@partners.org.

Publisher's Disclaimer: This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final citable form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

Keywords

End-of-life care; Life-Sustaining Treatment; Quality of Death; Racial Disparities

Introduction

Surgical care among patients who die is receiving increasing attention because surgery contributes to high healthcare costs,¹ intensity of treatment,² and utilization of hospital services.³ Higher technology treatment at the end of life is associated with worse quality of death⁴⁻⁶ for decedents and poor health outcomes for bereaved family members.^{7,8} This is of particular concern among surgical patients because prior studies have shown that, even when patients request withdrawal of care, fewer than half of surgeons who routinely perform high risk surgery are willing to honor that request in the first weeks following elective surgery or after surgical complications.⁹ Thus, better understanding factors that influence the intensity of treatment among patients who die after surgery is critical to improve healthcare quality and utilization, and improve the patient and family experience.

Prior studies have also shown that minorities receive higher intensity medical treatment when nearing the end of life than White patients.¹⁰⁻¹⁴ Prevailing theories are that deeper mistrust in the healthcare system, worse access to care, religiosity, and poorer communication between clinicians and minority patients are contributing factors. However, much less attention has been paid to the treatments we provide minority surgical patients, and whether race predicts differential intensity in life-sustaining treatments (LST) after major elective surgery. Presumably, racial disparities in the intensity of LST might not exist after elective surgeries because surgeons might be reluctant to withdraw life sustaining treatments if unexpected and serious surgical complications were to occur.

In this study we used the Nationwide Inpatient Sample to examine whether race-based differences exist in the use of life-sustaining treatments (LST) among patients who died following a major elective operation. We studied elective colectomy due to the fact that it is a common procedure performed for a variety of conditions.

Materials and Methods

Data source

We analyzed data from the Nationwide Inpatient Sample (NIS) from the Healthcare Cost and Utilization Project (HCUP) of the Agency for Healthcare Research and Quality (AHRQ) from calendar years 2006 through 2011. The NIS is the largest national all-payer database which annually collects information on as many as 8 million inpatient discharges across approximately 1000 United States hospitals in 44 states. This data represents an approximate 20% stratified sample of nonfederal and non-rehabilitation hospitals in the United States.

Analytic Sample

We identified patients 40 years and over who had elective admissions for colectomies (ICD-9 codes 45.7* and 45.8*) and who died during the same hospital admission (N=1,887).

Patients with missing income data (N=29; 1.5%) and missing race (N=364; 19.3%) were excluded. Because we were interested in treatment intensity in the context of death, we included only patients who died in-hospital to frame our analysis on a patient population with uniform outcome.³

Variables

The primary predictor variable in our study was patient race, which we recoded into White, Black, Hispanic, and Other. Other (as recoded) included NIS race variables originally coded as “Asian or Pacific Islander”, “Native American”, or “Other”. Due to the survey sampling design of the NIS, discharge weights were used to derive national weighted estimates. Because race was a primary covariate of interest, we adjusted for missing values using re-weighted estimating equations methodology (RWEE).¹⁵ Logistic regression was used to calculate the probability of missing race by using non-missing patient characteristics. The inverse of this probability was then multiplied with the existing NIS discharge weights of non-missing observations. RWEE adjusted weights were then used in all subsequent multivariable regression models.

We included patient and hospital factors in our analysis including: age, gender, patient comorbidity, income (median by patient zip code), insurance type, length of stay, post-operative complications, hospital size, hospital region, and hospital teaching status. We assessed comorbidity burden for each patient using the Walraven comorbidity score, which is based on a multivariate model to predict in-patient death (where a score of 10 predicts approximately 6% in-hospital mortality and score of 15 predicts approximately 10% in-hospital mortality).¹⁶ Because postoperative complications are associated with the use of LST we also included the following major complications in our analysis: acute renal failure (ICD-9 584.5, 584.7, 584.8, 584.9), cerebrovascular accident (ICD-9 434*, 436*), acute myocardial infarction (ICD-9 410*), pulmonary embolism (ICD-9 415.1*), pneumonia (ICD-9 480*, 486*), and sepsis (sepsis, severe sepsis, septic shock; ICD-9 785.52, 995.5, 995.92).

Outcomes

Postoperative use of LST was our primary outcome. LST was defined as the presence of at least one of ten procedure codes indicating any of the following: cardiopulmonary resuscitation (CPR; ICD-9 99.60, 99.62–3), feeding gastrostomy tube placement (percutaneous endoscopic or open method; ICD-9 43.11 and 43.19), hemodialysis catheter placement (ICD-9 38.95), hemodialysis (ICD-9 39.95), mechanical ventilation (ICD-9 96.70–2), re-intubation (ICD-9 96.04), use of total parenteral nutrition (TPN; ICD-9 99.15), tracheostomy (ICD-9 31.1, 31.29), transfusion (ICD-9 99.0*), or use of vasopressors (ICD-9 00.17).^{14,17} We chose these specific interventions based on prior work,¹⁴ and with input from our own multidisciplinary group of surgeons, surgical intensivists, and palliative care physicians.

Analysis

In univariate analysis we examined patient and hospital characteristics of decedents meeting our inclusion criteria and the use of LST by race. We used Rao-Scott chi-square tests using

RWEE, clustering by hospital ID, and adjusting for NIS strata to compare differences in patient and hospital characteristics by patient race. We then used the same method to compare differences between patients who did and did not receive LST by race. Results are presented as means, standard deviations, and percentages where appropriate. In multivariate analysis we assessed the overall use of any LST and specific LST type by race using discharge weights adjusting for patient and hospital characteristics. Our multivariable logistic regression model included patient- and hospital-level factors including race, age, gender, insurance type, income, comorbidity, cancer diagnosis, hospital teaching status, bed size, and region as independent variables, and the use of any and individual LST modalities as dependent variables. We selected a p-value of < 0.05 to define statistical significance.

Because post-operative complications are associated with the use of LST we performed separate sensitivity analyses for the use of LST and those complications where there were significant differences by race. Also, recognizing that age could influence the use of LST, we performed separate sensitivity analysis for the use of LST using age as stratified variable (40–70 years; 71–80 years; 81–99 years). Results are reported as odds ratios and 95% confidence intervals.

This study was approved by the Partners Health Care Research Committee. The data analysis and output for this paper was generated using proc survey commands, SAS software, Version 9.2 of the SAS System for Windows, Copyright © 2008, SAS Institute Inc. SAS, Cary, NC, USA, to account for design effect, sample weights, and clustering of the complex NIS sample design.

Results

Patient and hospital characteristics

Of 128,142 total patients aged 40 and over who had an elective colectomy during the study period, 1,887 died, and 1,487 met our inclusion criteria ($N=8,538$ after weighting). (Table 1a) While the mean age across groups was over 65, Black patients tended to be younger than other groups (mean 69.6 years, $p=0.04$). There were no statistically significant differences in Walraven Comorbidity Score ($p=0.13$) or the proportion of patients who had cancer between groups ($p=0.10$). Whites had higher incomes, with 36.7% in the highest income quartile compared to 22% of Blacks, 4.8% of Hispanics, and 25.9% of other race ($p<0.001$). Although occurrence of acute renal failure differed significantly by race (Hispanic 70.6%, White 53.6%, Other 47.4%, and Black 35.2%, $p=0.02$), no difference was observed for other complications including: pneumonia, pulmonary embolism, acute MI, stroke, and sepsis.

Although most patients were treated at large hospitals, Whites were more likely than others to receive treatment at small hospitals (16.1% of White patients, 2.2% of Black patients, 2.5% of Other patients, and 1.3 % of Hispanic patients, $p=0.02$). Regional differences were statistically significant ($p=0.03$).

In unadjusted analysis comparing decedents who did and did not receive LST, race was the only patient characteristic that was significantly different between groups (Table 1b).

Use of LST by Race

In univariate analysis examining the use of individual types of LST by patient race, we found no significant differences in the use of any LST except CPR and re-intubation (Table 2). However, we observed that all non-White patients (i.e, Black, Hispanic, and Other) were significantly more likely to have undergone CPR or been re-intubated. Deceased Black patients were most likely to have received CPR (35.9%), followed by Hispanic (29.0%), Other (24.5%), and White (11.7%) patients (Overall: 14.8%, $p=0.002$). Moreover, deceased Hispanic patients were most likely to have been re-intubated (75.0%) followed by Other (69.0%), Black (52.3%), and White (45.2%) patients (Overall: 47.7%, $p=0.01$).

In multivariate analysis, decedent Black (OR 3.67, 95% CI 1.50–4.14, $p=0.01$) and Hispanic patients (OR 4.21, 95% CI 1.14–15.56, $p=0.03$) had significantly increased odds of receiving CPR as compared to White patients. Additionally, decedent Hispanic patients also had significantly increased odds of having been re-intubated (OR 4.24, 95% CI 1.39–12.92, $p=0.01$).

Because post-operative complications are associated with the use of LST and the occurrence of acute renal failure (ARF) differed significantly among races, we performed separate sensitivity analyses for the use of CPR and re-intubation by race and ARF that demonstrated non-Whites were still more likely to have received CPR and re-intubation. Although there were no Hispanic patients between ages 71–80 years who received CPR in our study, among decedents 41–70 years of age, 59.3% of Hispanics and 33.7% of Blacks underwent CPR compared with 12.9% of Whites ($p<0.001$). Additionally, among decedents 81–99 years, 45.8% of Blacks had CPR compared to 1.3% of Whites ($p<0.001$). Similarly, Hispanics were significantly more likely to be reintubated than Whites across age strata (41–70 years: 86.3% vs. 39.3%; 71–80 years: 63.1% vs. 60%; 81–99 years: 67.2% vs. 43.9%, $p<0.001$).

Discussion

Our findings add to the evidence base that racial disparities exist in the use of LST in surgical as well as medical patients. Even after adjustment for age, comorbidities, complications, and other demographic factors, race-based differences exist in the use of certain LST in patients who die following a major elective operation. Specifically, we found that Black and Hispanic decedents were substantially more likely to have undergone CPR, and that Hispanic decedents were more likely to have been re-intubated than White patients who died. CPR and re-intubation are fundamentally different than the other LSTs we studied because they are typical in “code” scenarios for cardiopulmonary failure. Thus, while there appeared to be no significant racial differences in the use of other treatments, our findings may suggest meaningful race-based differences in “do-not-resuscitate” and “do-not-intubate” orders in surgical patients. These findings further extend our knowledge of the extent racial disparities play in treatment at the end of life and challenge surgical clinicians to identify underlying etiologies so that they can be appropriately addressed.

There are several surgeon-specific behaviors that may contribute to the race-based differences in treatment that we observed. Prior evidence demonstrates that surgeons are reluctant to withdraw life sustaining treatments when life-threatening complications follow

elective procedures.⁹ Moreover, “Surgical buy-in,” or the implied agreement between surgeons and patients that patients will endure potentially burdensome postoperative treatments necessary to achieve the best surgical outcome, may lead to a bias on the part of some surgeons to continue maximal life-sustaining measures even when the chances of success are low and even when this is contrary to the patient preferences.¹⁸ Feelings of shame, grief, and personal responsibility after complications can contribute to avoidant behavior on the part of surgeons who have difficulty transitioning to a comfort-oriented approach.^{19,20} However, in order for these explanations to account for the differences we observed, surgeons’ treatment and communication practices would need to vary by patient race. Although this is possible, we were not able to detect such differences using our data set and these questions may be valuable future inquiries.

From the patient’s perspective, mistrust of the healthcare system²¹, cultural beliefs that reject comfort-oriented approaches,²² non-English language,²³ and lower acculturation,²⁴ contribute to preferences for more medically intensive treatments at the end of life. Family-centered decision-making among some ethnic groups may limit the use of advance directives.²⁵ Still, others have reported that health literacy, not race, is predictive of patient preferences in end-of-life care.²⁶ Patients who have lower levels of education, or do not have English as their first language, are less likely to engage in preoperative advance care planning.²⁷ Whether individually or in combination, these issues are likely contributors to the racial disparities in end-of-life care we observed.

Our analysis suggests that race is a key contributor to high rates of health care utilization associated with surgical care near the end of life, and that racial disparities may expose non-Whites to worse death experiences as a consequence. Potential interventions could include cultural competency training for surgical clinicians who care for patients with advanced illness, and initiatives to engage minority patients in preoperative advance care planning.

Our work has several limitations. First, our analysis and results are based on data collected in the NIS administrative database and is therefore dependent on the completeness and accuracy of data recording. Given the large variability in coding across hospitals, and different incentives that exist for non-uniform coding practices, these results may not be generalizable to all inpatient care delivery systems.^{28,29} Second, because we limited our study population to patients 40 years of age and over these findings may not apply to younger patients. Third, the quality of the “follow-back” study design (study of patients carried out after death) has been criticized for not being able to fully capture patient risk factors or preferences.³⁰ For example, NIS does not have data on the availability of advanced directives. However, it is unlikely that these potential sources of confounding would result in the magnitude of differences we observed. Clinicians have difficulty predicting which patients are dying, and the frequency and distribution of LST among patients who survive may be quite different. We attempted to overcome this limitation in our analysis by adjusting for comorbidities and surgical complications. However, using administrative data we cannot exclude the possibility that some conditions coded as comorbidities could be a consequence of the surgical procedure. Thus, the data we present can only be offered as a surrogate to understand what really happens at the bedside.

Conclusion

This study reveals that Black and Hispanic patients who die after elective surgery are more likely to receive CPR and re-intubation respectively, and raises a concern that racial minorities at risk for non-beneficial higher intensity treatments and a worse death experience. The patterns observed here should prompt additional inquiry to better understand the key contributors to differences in end-of-life care for surgical patients.

Acknowledgments

Dianali Rivera Morales, MS, assisted with manuscript preparation. Hsin-Hsiao Wang, MD, MPH assisted with study design.

Roland Hernandez was supported by the Arthur Tracy Cabot Fellowship.

Zara Cooper was supported by a Loan Repayment Grant National Institute on Minority Health and Health Disparities, and a grant from the Klarman Family Foundation.

Dr. López thanks the RWJ Foundation Harold Amos Faculty Development Program and NIDDK 1K23DK098280-01.

Dr. Cooper had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

Drs. Hernandez, López, Finlayson, and Cooper, and Mr. Hevelone, have no conflicts of interest to declare.

References

1. Hartman M, Martin AB, Benson J, Catlin A. National Health Expenditure Accounts T. National health spending in 2011: overall growth remains low, but some payers and services show signs of acceleration. *Health Aff (Millwood)*. 2013; 32(1):87–99. [PubMed: 23297275]
2. Teno JM, Gozalo PL, Bynum JP, et al. Change in end-of-life care for Medicare beneficiaries: site of death, place of care, and health care transitions in 2000, 2005, and 2009. *JAMA*. 2013; 309(5):470–477. [PubMed: 23385273]
3. Kwok AC, Semel ME, Lipsitz SR, et al. The intensity and variation of surgical care at the end of life: a retrospective cohort study. *Lancet*. 2011; 378(9800):1408–1413. [PubMed: 21982520]
4. Wright AA, Zhang B, Ray A, et al. Associations between end-of-life discussions, patient mental health, medical care near death, and caregiver bereavement adjustment. *JAMA*. 2008; 300(14):1665–1673. [PubMed: 18840840]
5. Wright AA, Keating NL, Balboni TA, Matulonis UA, Block SD, Prigerson HG. Place of death: correlations with quality of life of patients with cancer and predictors of bereaved caregivers' mental health. *J Clin Oncol*. 2010; 28(29):4457–4464. [PubMed: 20837950]
6. Zhang B, Nilsson ME, Prigerson HG. Factors important to patients' quality of life at the end of life. *Arch Intern Med*. 2012; 172(15):1133–1142. [PubMed: 22777380]
7. Anderson WG, Arnold RM, Angus DC, Bryce CL. Posttraumatic stress and complicated grief in family members of patients in the intensive care unit. *J Gen Intern Med*. 2008; 23(11):1871–1876. [PubMed: 18780129]
8. Siegel MD, Hayes E, Vanderwerker LC, Loseth DB, Prigerson HG. Psychiatric illness in the next of kin of patients who die in the intensive care unit. *Crit Care Med*. 2008; 36(6):1722–1728. [PubMed: 18520637]
9. Schwarze ML, Redmann AJ, Brasel KJ, Alexander GC. The role of surgeon error in withdrawal of postoperative life support. *Annals of surgery*. 2012; 256(1):10–15. [PubMed: 22584696]
10. Wicher CP, Meeker MA. What influences African American end-of-life preferences? *J Health Care Poor Underserved*. 2012; 23(1):28–58. [PubMed: 22643461]

11. Loggers ET, Maciejewski PK, Paulk E, et al. Racial differences in predictors of intensive end-of-life care in patients with advanced cancer. *J Clin Oncol*. 2009; 27(33):5559–5564. [PubMed: 19805675]
12. Smith AK, Earle CC, McCarthy EP. Racial and ethnic differences in end-of-life care in fee-for-service Medicare beneficiaries with advanced cancer. *J Am Geriatr Soc*. 2009; 57(1):153–158. [PubMed: 19054185]
13. Zheng NT, Mukamel DB, Caprio T, Cai S, Temkin-Greener H. Racial disparities in in-hospital death and hospice use among nursing home residents at the end of life. *Med Care*. 2011; 49(11):992–998. [PubMed: 22002648]
14. Hanchate A, Kronman AC, Young-Xu Y, Ash AS, Emanuel E. Racial and ethnic differences in end-of-life costs: why do minorities cost more than whites? *Arch Intern Med*. 2009; 169(5):493–501. [PubMed: 19273780]
15. Henry AJ, Hevelone ND, Lipsitz S, Nguyen LL. Comparative methods for handling missing data in large databases. *J Vasc Surg*. 2013; 58(5):1353–1359. e1356. [PubMed: 23830314]
16. van Walraven C, Austin PC, Jennings A, Quan H, Forster AJ. A modification of the Elixhauser comorbidity measures into a point system for hospital death using administrative data. *Med Care*. 2009; 47(6):626–633. [PubMed: 19433995]
17. Barnato AE, Farrell MH, Chang CC, Lave JR, Roberts MS, Angus DC. Development and validation of hospital “end-of-life” treatment intensity measures. *Med Care*. 2009; 47(10):1098–1105. [PubMed: 19820614]
18. Schwarze ML, Bradley CT, Brasel KJ. Surgical “buy-in”: the contractual relationship between surgeons and patients that influences decisions regarding life-supporting therapy. *Critical Care Medicine*. 2010; 38(3):843–848. [PubMed: 20048678]
19. Buchman TG, Cassell J, Ray SE, Wax ML. Who should manage the dying patient?: Rescue, shame, and the surgical ICU dilemma. *J Am Coll Surg*. 2002; 194(5):665–673. [PubMed: 12022609]
20. Aslakson RA, Wyskiel R, Thornton I, et al. Nurse-perceived barriers to effective communication regarding prognosis and optimal end-of-life care for surgical ICU patients: a qualitative exploration. *J Palliat Med*. 2012; 15(8):910–915. [PubMed: 22676315]
21. Blackhall LJ, Frank G, Murphy ST, Michel V, Palmer JM, Azen SP. Ethnicity and attitudes towards life sustaining technology. *Soc Sci Med*. 1999; 48(12):1779–1789. [PubMed: 10405016]
22. Johnson KS, Kuchibhatla M, Tulskey JA. What explains racial differences in the use of advance directives and attitudes toward hospice care? *J Am Geriatr Soc*. 2008; 56(10):1953–1958. [PubMed: 18771455]
23. Born W, Greiner KA, Sylvia E, Butler J, Ahluwalia JS. Knowledge, attitudes, and beliefs about end-of-life care among inner-city African Americans and Latinos. *J Palliat Med*. 2004; 7(2):247–256. [PubMed: 15130202]
24. Wright AA, Stieglitz H, Kupersztuch YM, et al. United states acculturation and cancer patients’ end-of-life care. *PLoS One*. 2013; 8(3):e58663. [PubMed: 23536809]
25. Teno JM, Mor V, Ward N, et al. Bereaved family member perceptions of quality of end-of-life care in U.S. regions with high and low usage of intensive care unit care. *J Am Geriatr Soc*. 2005; 53(11):1905–1911. [PubMed: 16274371]
26. Volandes AE, Paasche-Orlow M, Gillick MR, et al. Health literacy not race predicts end-of-life care preferences. *J Palliat Med*. 2008; 11(5):754–762. [PubMed: 18588408]
27. Ankuda, CK.; Block, SD.; Cooper, Z., et al. Measuring quality of decision making for advanced care planning and surgery. Paper presented at: Academic Surgical Congress; 2012; Las Vegas, NV.
28. Iezzoni, L. Data Sources and Implications: Administrative Database. In: Iezzoni, L., editor. *Risk Adjustment for Measuring Health Outcomes*. 2. Chicago, Illinois: Health Administration Press; 1997. p. 169–242.
29. Simborg DW. DRG creep: a new hospital-acquired disease. *N Engl J Med*. 1981; 304(26):1602–1604. [PubMed: 7015136]
30. Kelley AS. Treatment intensity at end of life--time to act on the evidence. *Lancet*. 2011; 378(9800):1364–1365. [PubMed: 21982519]

Abbreviated Summary

Prior studies have found increased use of life-sustaining treatments (LST) among racial minorities in medical patients. Surgical care is unique, however, in that surgeons are reluctant to withdraw care in the setting of complications or after elective operations. We therefore sought to examine whether racial disparities in the use of LST existed among patients who died following elective colectomy.

Table 1a

Patient and hospital characteristics by patient race.

Patient Race	White (* N=7,193; 84.3%)	Black (* N=817; 9.6%)	Hispanic (* N=303; 3.5%)	Other (* N=224; 2.6%)	p-value
Patient Characteristics					
Age (y) (Mean±SD)	74.7±25.1	69.6±31.4	71.4±21.2	71.4±20.0	0.04
Female (%)	46.6	42.6	51.1	32.2	0.70
LOS (d) (Mean±SD)	17.5±51.4	13.6±34.0	21.0±60.7	25.2±74.4	0.12
Wlraven ^a (Mean±SD)	12.5±20.6	10.6±23.7	12.7±16.9	8.8±17.1	0.13
Cancer Diagnosis (%)	40.1	39.5	39.7	41.0	0.10
Income Quartile (%)					
1st (low)	20.0	42.4	72.6	40.4	<0.001
2 nd	23.0	16.1	5.3	22.2	
3 rd	20.3	19.5	17.3	11.5	
4th (high)	36.7	22.0	4.8	25.9	
Insurance (%)					
Public	79.3	84.0	80.1	90.5	0.16
Private	18.5	14.5	16.7	9.5	
None	2.2	1.5	3.2	0.00	
Complications (%)					
Acute Myocardial Infaret	11.0	9.7	10.1	9.2	0.99
Acute renal failure	53.6	35.2	70.6	47.4	0.02
Cerebrovascular Accident	4.2	1.7	3.3	4.0	0.46
Pneumonia	15.6	14.7	12.9	32.4	0.38
Pulmonary Embolous	3.4	3.9	12.6	1.7	0.20
Sepsis	49.9	47.0	71.0	66.2	0.19
Hospital Characteristics					
Bed Size (%)					
Small	16.1	2.2	1.3	2.5	0.02
Medium	25.2	35.0	30.5	38.9	

Patient Race	White (* N=7,193; 84.3%)	Black (* N=817; 9.6%)	Hispanic (* N=303; 3.5%)	Other (* N=224; 2.6%)	p-value
Large	58.7	62.8	68.2	58.6	
Region (%)					
Northeast	69.4	61.8	54.5	55.9	0.03
Midwest	4.0	2.8	0.3	3.8	
South	22.1	31.8	34.8	27.8	
West	4.5	3.6	10.4	12.6	
Teaching Hosp (%)	51.7	64.8	67.5	60.8	0.18

^a Walraven Comorbidity score based on regression model predicting in-hospital death, where a score of 10 predicts approximately 6% in-hospital mortality and score of 15 predicts approximately 10% in-hospital mortality. LOS = length of stay; d = days; y = years;

* Upweighted from NIS discharge data.

Table 1b

Patient and hospital characteristics according to use of any life-sustaining treatment among decedents.

	No LST (* N=1685; 19.7%)	Yes LST (* N=6853; 80.3%)	p-value
Patient Characteristics (Mean ± SD)			
Age (years)	73.9 ± 28.3	74.0 ± 25.0	0.97
LOS (days)	16.1 ± 43.9	17.8 ± 53.4	0.53
Walraven ^a	12.2 ± 19.6	12.2 ± 21.0	0.98
Race (%)			
White	20.2	79.8	0.03
Black	25.3	74.7	
Hispanic	7.6	92.4	
Other	2.4	97.6	
Gender (%)			
Male	18.1	81.9	0.39
Female	21.7	78.3	
Insurance Type (%)			
Public	18.9	81.1	0.64
Private	23.7	76.3	
None	19.9	80.1	
Income Quartile (%)			
1st (low)	24.3	75.7	0.46
2 nd	20.7	79.3	
3 rd	15.5	84.5	
4th (high)	18.4	81.6	
Hospital type (%)			
Non-teaching	20.9	79.1	0.66
Teaching	18.7	81.3	
Hospital size (%)			
Small	27.1	72.9	0.13
Medium	12.8	87.2	
Large	21.1	78.9	
Region (%)			
Northeast	20.5	79.5	0.63
Midwest	16.6	83.4	
South	19.1	80.9	
West	14.3	85.7	
Complications			
AMI	16.7	83.3	0.61
ARF	16.2	83.8	0.06

	No LST (* N=1685; 19.7%)	Yes LST (* N=6853; 80.3%)	p-value
CVA	6.3	93.7	0.008
Pneumonia	6.9	93.1	<0.001
PE	15.8	84.2	0.63
Sepsis	13.5	86.5	0.68
Severe Sepsis	17.4	82.6	
Septic Shock	19.2	80.8	

Univariate descriptive data on age (continuous), race, gender, insurance type, income (quartiles), hospital teaching status, bedsize, and region.

^a Walraven Comorbidity score based on regression model predicting in-hospital death, where a score of 10 predicts approximately 6% in-hospital mortality and score of 15 predicts approximately 10% in-hospital mortality. LOS = length of stay; d = days; y = years; AMI = acute myocardial infarction; ARF = acute renal failure; CVA = cerebrovascular accident; PE = pulmonary embolism.

* Upweighted from NIS discharge data.

Table 2

Frequency of Life-sustaining therapies during admissions (%).

LST Type	All (N = 8,538)	White (N = 7,193)	Black (N = 817)	Hispanic (N = 303)	Other (N = 224)	p-value
CPR	14.8	11.7	35.9	29.0	24.5	0.002
Feeding Tube	8.1	8.2	3.0	13.0	15.4	0.39
HD Catheter	12.4	13.4	5.3	13.7	15.1	0.36
Hemodialysis	15.6	16.0	12.1	11.9	18.9	0.91
Mech. Vent	57.1	58.6	42.4	53.2	68.0	0.15
Re-intubation	47.7	45.2	52.3	75.0	69.0	0.01
TPN	27.6	28.6	18.8	23.7	31.2	0.52
Tracheostomy	9.6	9.7	6.0	7.1	21.3	0.33
Transfusion	55.2	54.6	53.7	62.7	68.6	0.73
Vasopressors	5.2	5.7	2.7	1.5	1.5	0.09

Frequency of life-sustaining therapies used in each race by procedure type, and the univariate analysis between race and life-sustaining therapies (chi-square/fisher's exact test). N = NIS-weighted number of patients; CPR = cardiopulmonary resuscitation; HD catheter = hemodialysis catheter; Mech. Vent = mechanical ventilation; TPN = total parenteral nutrition.

Table 3

Adjusted odds of life-sustaining therapy by decedent race.

Race (Ref: White)	Black		Hispanic		Other	
	OR (95%CI)	p-value	OR (95%CI)	p-value	OR (95%CI)	p-value
LST Type						
CPR	3.67 (1.31–10.32)	0.01	4.21 (1.14–15.55)	0.03	2.56 (0.69–9.50)	0.16
Feeding Tube	0.46 (0.14–1.47)	0.19	2.21 (0.31–15.83)	0.43	2.94 (0.50–17.31)	0.23
HD Catheter	0.40 (0.12–1.27)	0.12	0.75 (0.24–2.29)	0.61	1.09 (0.14–8.31)	0.94
Hemodialysis	0.62 (0.14–2.77)	0.54	0.40 (0.11–1.53)	0.18	1.16 (0.15–8.97)	0.89
Mech. Vent	0.52 (0.22–1.25)	0.14	0.74 (0.36–1.53)	0.42	0.86 (0.37–2.01)	0.73
Re-intubation	1.54 (0.72–3.29)	0.26	4.24 (1.39–12.92)	0.01	2.66 (0.92–7.65)	0.07
TPN	0.65 (0.24–1.74)	0.39	0.61 (0.19–1.94)	0.40	1.22 (0.45–3.30)	0.69
Tracheostomy	0.61 (0.17–2.23)	0.45	0.55 (0.11–2.82)	0.47	1.95 (0.37–10.32)	0.43
Transfusion	1.15 (0.55–2.40)	0.70	1.38 (0.54–3.57)	0.50	2.07 (0.67–6.39)	0.20
Vasopressors	0.37 (0.08–1.77)	0.21	0.22 (0.02–2.19)	0.20	0.20 (0.03–1.29)	0.09

Multivariate model with independent variables including patient level factors- race, age, gender, insurance, income, comorbidities and hospital level factors- teaching status, bedsize, and region. Dependent variables are life-sustaining therapies. OR = odds ratio; CPR = cardiopulmonary resuscitation; HD catheter = hemodialysis catheter; Mech. Vent = mechanical ventilation; TPN = total parenteral nutrition.