

# Should we perform elective inguinal hernia repair in the elderly?

J. J. Wu<sup>1</sup>  · B. C. Baldwin<sup>2</sup> · E. Goldwater<sup>3</sup> · T. C. Counihan<sup>4</sup>

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## Abstract

**Purpose** Many surgeons are reluctant to offer elective inguinal and femoral hernia repair (IHR) to the elderly due to concerns of increased risk. The authors sought to evaluate the outcomes of elderly patients undergoing IHR compared to the general population.

**Methods** We performed a retrospective review of the 2011 NSQIP database evaluating 19,683 patients undergoing IHR. Patients were divided by age into three categories: <65, 65–79 and >80. Logistic regression analysis was used to assess impact of comorbid conditions and type of surgery on outcomes. Patients were analyzed for mortality and complications based on their age and the types of surgery (elective, urgent, emergent, laparoscopic versus open) and comorbid conditions.

**Results** There were 17,375 male patients (88 %). 92.7 % were elective. 70 % were performed using an open technique. Age distribution was 63.4 % < 65, 26.6 % 65–79, 10 % >80. Mortality was similar across age groups in elective repair. Mortality was increased in emergency repair in all age groups ( $p < 0.001$ ). Mortality was increased in emergency surgery compared to elective surgery in patients >80 (OR = 57,  $p < 0.001$ ). Mortality was similar between laparoscopic and open in <65 (OR = 0.96,  $p = 0.97$ ) and

unable to be assessed in other age groups. Dyspnea and COPD predicted higher mortality and complications with emergency surgery in the elderly (age 65–79 OR 15.3 and 14.9, respectively, age >80 OR 56.5 and 14.9, respectively).

**Conclusions** Elective inguinal hernia repair carries a similar mortality in the elderly compared to the general population. Emergent IHR carries a very high risk of death in the elderly. The authors recommend considering elective IHR regardless of age.

## Introduction

Inguinal hernia surgery is the most frequently performed general surgery operation in the United States [1]. As our population ages the incidence of inguinal hernias is also increasing in the elderly [2]. Factors contributing to the increased prevalence of abdominal wall hernias in the elderly include loss of strength of the abdominal wall and other comorbid conditions that can increase intra-abdominal pressures (e.g., chronic obstructive pulmonary disease, benign prostatic hypertrophy, etc.). In the US, by 2005, approximately 19,000 unilateral inguinal hernia repairs (IHR) were performed in people 65 years and older [3]. Numerous studies have shown that the elderly, especially those older than 80 years of age carry an increased risk of mortality after surgery [4]. With emergent IHR, a 5- to 15-fold increased risk of mortality has been seen [5–11]. However, the elderly tend to have good outcomes with a complication rate similar to younger patients when undergoing elective inguinal hernia repair [5–7, 10]. With this knowledge, the simple conclusion would be that elderly patients undergoing emergent inguinal hernia surgery would be at increased risk and that elective hernia repairs should be encouraged by surgeons to minimize these risks. However,

✉ J. J. Wu  
Jacqueline.wumd@baystatehealth.org

<sup>1</sup> Baystate Medical Center, 759 Chestnut Street, Springfield, MA 01199, USA

<sup>2</sup> Berkshire Medical Center, 725 North Street, Pittsfield, MA 01201, USA

<sup>3</sup> University of Massachusetts Amherst, Amherst, MA, USA

<sup>4</sup> Veteran Affairs Medical Center, White River Junction, VT, USA

doubts have remained as to whether a liberal approach to repair in asymptomatic elderly patients is appropriate or cost effective. Some authors have strongly advocated the option of watchful waiting [9, 12, 13]. Others feel that due to the morbidity and mortality associated with emergency surgeries and the fact that most hernias that are watched eventually require surgery, elective hernia repairs should be offered to the elderly [8, 10, 12, 14, 17]. To study this issue, our group compared the postoperative morbidity and mortality of emergent and non-emergent inguinal and femoral hernia repair in the elderly (age 65 and above) and non-elderly (age less than 65) using data gathered from the American College of Surgeons National Surgical Quality Improvement Program (NSQIP) from 2011. Secondly, our study identified specific preoperative comorbidities that were associated with an increased risk of postoperative morbidity and mortality.

## Methods

All patient data from the 2011 NSQIP database were downloaded onto local software. 19683 patients undergoing inguinal or femoral hernia surgery were identified by the CPT codes 49553, 49550, 49507, 49505, 49525, 49557, 49555, 49521, 49520, 49650, 49651 and selected for study. Patients were grouped by age: less than 65 years, 65–79 years and 80 years and older. Variables such as basic demographics, surgery status (elective versus emergent), surgical approach (laparoscopic versus open repair), co-morbid conditions, and postoperative outcomes including mortality were analyzed.

## Statistical analysis

All analyses were done using Stata Statistical Software, Release 11 (StataCorp. 2009. College Station, TX: StataCorp LP). Logistic regression was used to compute odds ratios (OR) comparing mortality and morbidity between emergent and elective surgery within each age group, adjusted for surgical approach. Similarly, we computed odds ratios comparing mortality and morbidity in the presence to absence of each co-morbidity within age group, adjusted for surgery status and surgical approach.

Morbidity outcomes considered included ventilator for over 48 h, return to OR, readmission within 30 days, and presence of “any” surgical complication (defined as death within 30 days, superficial wound infection, deep infection, organ space infection, ventilator use for over 48 h, sepsis or septic shock). Other outcomes analyzed were readmission, return to operating room and need for bowel resection.

## Results

19,683 patients were included in the analysis. Basic demographics are listed in Table 1. The majority of patients were male (88 %) and less than 65 years of age (63.4 %). Most hernias were repaired electively (92.7 %) and in an open fashion (74 %). The incidence of comorbid conditions and risk factors is shown in Fig. 1. With the exception of smoking, the incidence of comorbidities and risk factors increased with increasing age. The significant increase in mortality with increasing age for elective and emergent surgery is shown in Fig. 2. The data also revealed that the odds of mortality significantly increased with emergent status compared to elective status in all age groups ( $p < 0.001$ ) (Table 2) with mortality of non-elective IHR in the 80 and older age group increasing to 10.3 % compared to elective mortality of 0.19 %.

## Laparoscopic versus open surgery

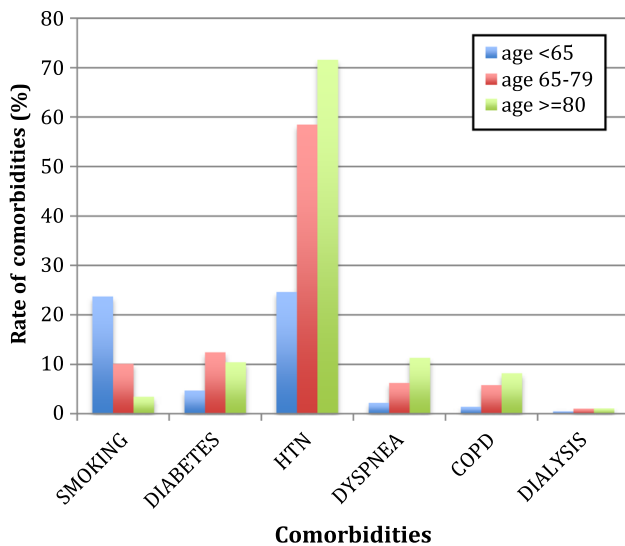
Twenty-six percent of all hernias in the 2011 NSQIP database were performed laparoscopically. Frequency of laparoscopic surgeries decreased with age with both the elective and non-elective status (Fig. 3). Mortality was similar between laparoscopic (0.028 % in elective cases and 1.4 % in emergent cases) and open IHR (0.012 % in elective cases and 0.5 % in emergent cases) in the <65 age group (OR = 0.96,  $p = 0.97$ ). Mortality could not be assessed in the 65–79 age, and 80 and older category due to the low mortality rate in elective cases and so few laparoscopic cases in these age groups.

## ASA score

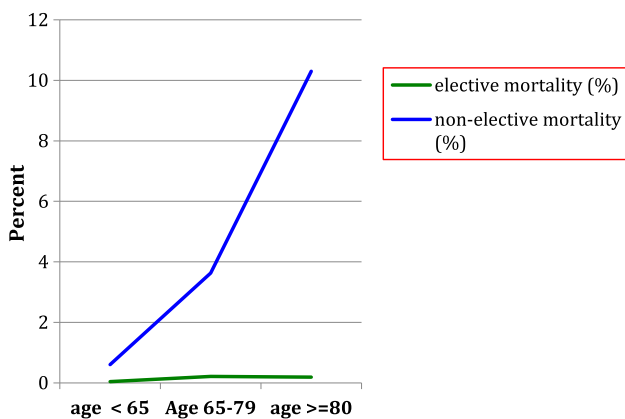
We also examined mortality as it related to ASA class by combining ASA I and II patients for comparison with

**Table 1** Demographics

	Number	Percent
Gender		
Male	17,375	88
Female	2271	12
Surgery status		
Elective	18,246	92.7
Non-elective	1436	7.3
Surgery mode		
Laparoscopic	5126	26
Open	14,556	74
Age		
<65	12,477	63.4
65–79	5234	26.6
≤80	1963	10



**Fig. 1** Comorbid conditions by age



**Fig. 2** Mortality versus age by elective and non-elective surgery

ASA III and IV patients and found that the mortality rate was extremely low in all ASA classes, even in the over 80 age group (Table 3). For elective IHR patients over 80 years of age with ASA 3 or 4, mortality rate was still extremely low at 0.0011 %.

**Bowel resection**

The incidence of concomitant bowel resection during inguinal hernia repair is shown in Table 4. The mortality related specifically to bowel resection was 1.9 % (1 in 53) in patients under 65, 3.4 % (2 in 59) in 65–79 year-olds, and 18.75 % (15 in 80) in patients over 80. Compared to patients not requiring bowel resection in patients over 80, there was a statistically significant relationship with mortality ( $p < 0.0001$ ).

**Discussion**

The concern when recommending any elective surgery in older patients with comorbid conditions is the potential for complications. Several previous studies have specifically focused on the increased mortality in emergency hernia surgery in the elderly. One retrospective series that evaluated only emergent IHR found a very high mortality rate (9 %) and recommended early repair [15]. Other studies compared elective to emergency repair in case series and also concluded that every effort should be made to repair hernias electively [10, 11, 16]. Our data clearly show an increase in mortality with emergency hernia repair that is related to age, and no such increase for elective hernia repair. We have also shown that the odds of adverse outcomes are significantly greater in emergent surgeries in all age groups, but are especially so for mortality and “any” complication in the older age groups. For elective surgery, the rates remain low in all age groups. We therefore conclude, as others have, that elective hernia repair is safe and associated with a low morbidity and mortality and thus should be offered to the elderly.

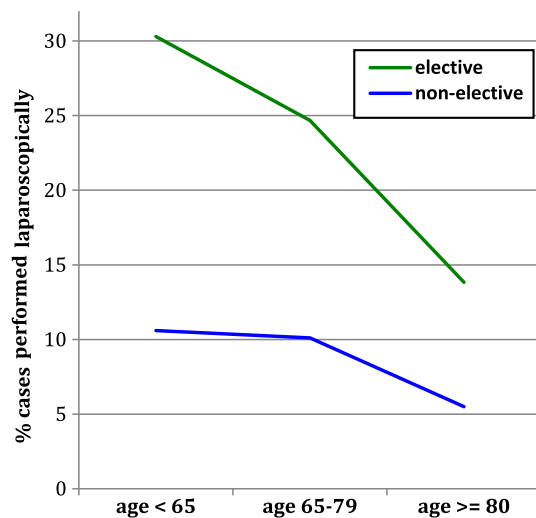
Because of the potential for more complications, there is often apprehension when recommending elective surgery in older patients. It has been shown recently that mortality did not increase with increasing age in elective IHR [8, 17]. Similarly, Pallati et al. found a very low mortality rate until patients were in their 90 s. Our study did not show an increase in mortality purely related to age in elective IHR. Odds ratios, however, did show an increase in mortality and complications related to certain co-morbid conditions (COPD, dyspnea, smoking, hypertension, diabetes). However, the rates were still so low in these patients that the data may not be clinically relevant. Based on the very low rate of complications in the older patients, even those with comorbidities, we feel that elective repair is indeed safe in the elderly patient with comorbidities.

Despite low mortality rates in the average elderly surgical patient, several authors have focused on using straight local anesthesia to highlight safety in this very high risk group with good results [18, 19]. In the course of our data analysis, we did observe that local and regional anesthesia was used more frequently with older patients. However, we chose not to focus our analysis on this. We did examine the relationship of ASA class with outcomes. Although ASA classification has been correlated to mortality in some studies, we wanted to look at specific comorbid conditions to see if there were certain ones that would affect the recommendation to perform elective hernia repair. Even in the over 80 age group, mortality for patients with ASA class 3 or 4 was still exceedingly low at 0.0093 % for all cases and 0.0011 % for elective IHRs. In fact, when

**Table 2** Rates of mortality and morbidity and odds ratios comparing emergent to elective surgery, by age

Outcome	Age		65–79			≥80			
	<65		%	Odds ratio	<i>p</i> value	%	Odds ratio	<i>p</i> value	
	%	Odds ratio	%	Odds ratio	<i>p</i> value	%	Odds ratio	<i>p</i> value	
Any ( <sup>a</sup> ) complication									
Elective	0.7		1.1			1.0			
Emergent	4.2	5.9	<0.001	10.9	9.8	<0.001	15.8	17.6	<0.001
Mortality									
Elective	0.0		.2			0.2			
Emergent	0.6	14.3	<0.001	3.6	17.5	<0.001	10.3	57.0	<0.001
Ventilator > 48 h									
Elective	0.0		.1			0.3			
Emergent	0.9	27.7	<0.001	3.1	30.1	<0.001	4.0	15.8	<0.001
Readmission									
Elective	1.5		3.0			4.6			
Emergent	4.3	2.7	<0.001	8.3	3.0	<0.001	12.6	3.3	<0.001
Return to OR									
Elective	0.4		1.0			1.0			
Emergent	2.8	6.9	<0.001	3.6	3.9	<0.001	4.7	4.7	<0.001

<sup>a</sup> Any complication = mortality within 30 days, superficial wound infection, deep infection, organ space infection, postoperative ventilator for more than 48 h, sepsis

**Fig. 3** Percentage of cases performed laparoscopically versus age by elective and non-elective surgery

examining ASA class versus age and mortality, the rates were so low, with no deaths in several of the categories, that *p* values could not be calculated. From this data we conclude that elective IHR in the elderly patient, even those with ASA class 3 or 4, can be safely performed with a low mortality risk.

An alternative to IHR in asymptomatic patients and an option often advocated in the elderly population is observation. Watchful waiting, especially in the elderly population, has been argued for many years primarily due to

**Table 3** ASA score versus age

Age	ASA class	Case type	Mortality rate (%)	<i>p</i> value
<65	1 and 2	All cases	0.0001	NA
		Elective only	0.0001	NA
	3 and 4	All cases	0.0013	0.193
		Elective only	0	NA
65–79	1 and 2	All cases	0	NA
		Elective only	0	NA
	3 and 4	All cases	0.024	0.025
		Elective only	0	NA
≥80	1 and 2	All cases	0	NA
		Elective only	0	NA
	3 and 4	All cases	0.0093	0.001
		Elective only	0.0011	NA

concerns of cost and postoperative inguinodynia. One of the main tenets to the watchful waiting approach is that the need for emergency surgery is rare during observation and that the consequences of emergency surgery are acceptable [9]. Unfortunately, many studies in this field do not adequately address the elderly patient [20–23]. Only two studies did look specifically at this population [7, 17]. Abi-Haidar looked at a cohort of IHRs and found increased mortality and complications in elderly IHR patients as well as patients with scrotal, femoral, and recurrent hernias and recommended these groups should not undergo watchful

**Table 4** Inguinal hernia repair with concomitant bowel resection

Age	No. of bowel resections	No. of bowel resections with associated mortality	Mortality rate with associated bowel resection (%)
<65	53	1	1.9
65–79	59	2	3.4
≥80	80	15	18.75

waiting [7]. Gianetta' looked at all groin hernias repaired over a 5-year period. Although their mean age was 74 and there were no perioperative deaths and complications were minimal, they did have 10 cases with strangulated bowel, leading the authors to conclude that elective hernia repair in the elderly was not only safe, but should be preferred to avoid strangulation [17]. Contrary to the above mentioned authors, the INCA Trialist Collaborative, who performed a Markov analysis pooling data from 20 studies, concluded that watchful waiting was appropriate in the elderly [9]. It is important to note though that in their study everyone 50 years and older was grouped into the elderly category and a 4 % mortality rate was assumed after emergency surgery. Also, follow-up times were not consistent across the patient population and some patients were lost to follow-up altogether, making watchful waiting and unreliable method of monitoring hernias.

Fitzgibbons, who had initially concluded from his study of men with asymptomatic or minimally symptomatic inguinal hernias that watchful waiting was safe, amended his recommendations after long-term follow-up of these patients showed a large number of patients crossing over from the watchful waiting arm to the surgical arm of the study [14]. Most of these patients were elderly and opted for surgery due to pain. Data from our study show that, consistent with the INCA study, there is a mortality rate of 3.6 % in the 65–79 age group. In the octogenarians though, the mortality rate jumps to a staggering 10 %. Based on findings of previous studies, the often inadequate follow-up of patients who are not operated on, as well as our own data showing increased mortality in the emergency cohort, we do not endorse watchful waiting in the elderly hernia patient.

Our study also examined the effect of laparoscopic versus open surgery on outcomes. Previous authors have suggested a laparoscopic approach might have benefits due to less pain, however, the need for general anesthesia and a higher recurrence rate may negate these effects [24, 25]. Hope et al. small retrospective study, although specifically looking at octogenarians, did not address short-term mortality of emergency versus elective IHR [25]. Also, because of small sample size, the study did not detect many differences between laparoscopic and open repairs except for

anticipated issues such as the increased use of general anesthesia in laparoscopy [25]. One large prospective VA trial conducted in NSQIP hospitals did manage to show that the incidence of the laparoscopic approach decreased with age and emergency status [26]. Even with relatively large numbers in our current series, we could not differentiate mortality based on surgical approach in the emergent cases in the elderly population. It is interesting to note that the rate of laparoscopic IHR (26 %) in our analysis of the 2011 NSQIP database was higher than rates in the past. Saleh's analysis of 2005–2010 NSQIP data for IHR showed a 16.9 % rate of laparoscopic repair [27]. Using the AHRQ, Smink found the rate of laparoscopic IHR in hernia in 2002–2003 to be slightly higher at 19.5 %, which is similar to the rate of 20 % encountered by Bourgon when analyzing New York state's ambulatory surgery databases for 2009–2010 [28, 29].

Several authors have focused on the need for bowel resection as a specific issue relating to emergent IHR [10, 11, 16]. Up for debate is the assumption that patients fare worse if a bowel resection is required. Whether this is due to the emergency setting or something inherent to the procedure is not clear. Ohana et al. and Alvarez et al. reported no correlation between bowel resection and mortality in incarcerated hernia patients while Kulah's group have found a strong relationship between bowel resection and mortality in emergency cases [10, 11, 16]. None of these studies had large numbers and therefore our findings are worth noting. We found a statistically significant increase in the need for bowel resection in emergency surgery patients. This effect increased with increasing age. We also found an independent relationship between bowel resection and mortality in patients over 80. These data further strengthen our argument for elective IHR. One caveat does exist—while the overwhelming number of bowel resections occur in patients with incarcerated femoral hernias in these studies, their small numbers meant they could not find a relationship to mortality. We had no mortalities in the 292 patients who had femoral hernias in our patient population, prohibiting any analysis on our part.

### Limitations

There are, of course, a number of limitations to this study. Although large, this is a retrospective review of prospectively collected data. While data collection in the NSQIP program is highly regulated and standardized, there is still some variability of data due to inaccuracies in the medical record that could affect the results of this analysis. The NSQIP program also relies on a sampling technique and therefore may misrepresent trends that would be different if the entire cohort of patients undergoing these procedures were analyzed. Inherent in the retrospective nature of this

study is the fact that we were not able to examine the indication for surgery, i.e., what the patients symptoms were, or if they had undergone watchful waiting prior to surgery. In addition, we were not able to analyze a surgeon's decision making process leading up to the decision of laparoscopic or open approach in a given patient. Also, our estimates of odds ratios are imprecise due to the fact that there are very few patients in certain categories. Finally, and most importantly, we do not have information on patients with inguinal hernias who did not undergo surgery and what their ultimate outcomes were.

## Conclusions

Elective inguinal hernia repair is safe in the majority of elderly patients. COPD, diabetes, smoking, dyspnea, and hypertension are independent risk factors that worsen results in both elective and, to a much greater extent, emergent cases. The dramatic increase in mortality and complications in elderly patients undergoing emergency IHR strongly suggests surgeons should offer elective repair to this patient population.

## Compliance with ethical standards

**Conflict of interest** JW declares no conflict of interest. BB declares no conflict of interest. EG declares no conflict of interest. TC declares no conflict of interest.

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