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Outcomes in the Older Patient Presenting with Acute Cholecystitis and Do Not Resuscitate (DNR) Status

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Abstract

Background: Acute cholecystitis is a common reason for surgical intervention in patients age 50+. The optimal management for elderly patients presenting with acute cholecystitis is unclear. No previous guidelines have been established to direct physicians to the most effective intervention.

Methods: A retrospective review was conducted to determine outcomes in patients over the age of 50 presenting with acute cholecystitis. Using Healthcare Cost and Utilization Project - National Inpatient Sample (HCUP-NIS) discharge data, from 2011 and 2012, patients with primary diagnosis of acute cholecystitis were identified. Patients were grouped by intervention: non-surgical management, surgical management or Percutaneous Cholecystostomy Tube (PCT) placement. DNR status was the main variable evaluated as a possible predictor of outcome.

Results: 14,234 cases were identified that fit our search criteria. The median age of patients was 74. Sepsis was present in (29.5%) of surgery patients, followed by PCT (14.6%) and non-surgical management (11.1%), ($p < 0.001$). The non-surgical management group had the lowest mean length of hospital stay (6 days) followed by surgery (9 days) and PCT (10 days), ($p < 0.001$). DNR status was highest in the PCT group (13.1%), followed by non-surgical management (11.9%) and surgery (4.9%), ($p < 0.001$). Results from this study revealed DNR status as an independent predictor of mortality (OR 3.8, $p < 0.001$).

Conclusion: To our knowledge no previous studies have evaluated associations between DNR status and mortality rates in patients age 50+ presenting with acute cholecystitis. As modern technologies that prolong life and survival emerge, and the elderly population keeps growing, end-of life issues discussions in primary care become essential in decision-making and outcomes in the acute setting.

Abbreviations:

PCT: Percutaneous Cholecystostomy Tube

DNR: Do Not Resuscitate

DNI: Do Not Intubate

HCUP-NIS: Healthcare Cost and Utilization Project - National Inpatient Sample

CVA: Cerebral Vascular Accidents

COPD: Chronic Obstructive Pulmonary Disease

ASA: American Society of Anesthesiologists

Introduction

Acute cholecystitis is a common reason for surgical intervention in patients age 50+. The optimal management for elderly patients presenting with acute cholecystitis is unclear. No previous guidelines have been established in the past to direct physicians to the most effective intervention. This has led to multiple treatment options including non-surgical management, surgical management, and Percutaneous Cholecystostomy Tube (PCT) placement. Although, each intervention leads to different outcomes, a common pattern is seen with all interventions: increased mortality rates in elderly patients with acute cholecystitis.

In patients 50+ this is important as goals of care should be discussed in the primary care setting, including DNR/DNI (Do Not Intubate) status and the scope of care related to each one. Although hospitals across the US have opted for code status documentation upon admission in the last few years, it is not considered the appropriate time for such conversation, which leaves room for further research about the impact of end-of-life

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issues in the outpatient setting and its influence during emergency situations. Moreover, goals of care should always be discussed with the primary care provider before evaluation for elective surgery as several studies have shown increased mortality in elderly patients undergoing elective cholecystectomy, among other procedures.

Method

A retrospective review was conducted to determine outcomes in patients over the age of 50 years presenting with acute cholecystitis. Using HCUP-NIS discharge data, from 2011 and 2012, patients with primary diagnosis of acute cholecystitis (ICD-9 codes: 57.40, 57.41 and 57.50) were identified. Patients were grouped by intervention: non-surgical management, surgical management (ICD-9 CM 51.21-51.24) or PCT (ICD-9 CM 51.01) placement. DNR status was the main variable evaluated as a possible predictor of outcome. Other variables observed included length of hospital stay, and sepsis. The primary outcome for in-hospital mortality was also reviewed. A logistic regression was then performed to determine which variables contributed to negative outcomes.

Results

14,234 cases were identified that fit our search criteria. The median age of patients was 74. Sepsis was present in (29.5%) of surgery patients, followed by PCT (14.6%) and non-surgical management (11.1%), ($p < 0.001$) (Table 1). The non-surgical management group had the lowest mean length of hospital stay (6 days), followed by surgery (9 days) and PCT (10 days), ($p < 0.001$). DNR status was highest in the PCT group (13.1%), followed by non-surgical management (11.9%) and surgery (4.9%), ($p < 0.001$). Table 1 shows the mortality in each group by intervention.

A comparison was carried out to understand the difference in patient characteristics between DNR and non-DNR group. In DNR compared to non-DNR, patients were significantly older (80.85 vs 72.9 years), had higher Charlson index score (4.9 vs 4.2), and higher mortality (17.9% vs 8.4%). On further analysis, patients with DNR status had higher in-hospital mortality with non-surgical management (50.7%), surgery (20.9%), and PCT (28.4%), ($p < 0.001$).

Forward logistic regression was conducted to determine which independent variables (age, gender, race, household income, Charlson comorbidity index, sepsis, DNR and type of surgical intervention) are predictors of mortality. Results from this analysis revealed that 3 out of the 8 variables contributed to mortality. DNR status as an independent predictor of mortality (OR 3.8, $p < 0.001$) (Table 2). Other predictors of in hospital mortality included female sex (OR 1.5), non-surgical management (OR 2.5) and PCT (OR 1.9), all $p < 0.001$. Age, household income, race, Charleson score and sepsis did not contribute to prediction of in-hospital mortality.

Discussion

In the patients age 50+ acute cholecystitis is rather frequent and more severe, leading to significant increased mortality rates. Moreover, several comorbidities are usually present along with the acute process in the older patient [1]. In a study that evaluated conservative treatment for acute cholecystitis, Barak O et al. showed that age greater than 70 years is an independent predictor of failure of conservative management [2]. Median age of presentation in this study was 74 years. Other studies have shown a median age between 61-81 years [3].

Urgent surgical management is essential in the treatment of older patients presenting with acute cholecystitis. Early cholecystectomy remains the standard treatment for most patients [4]. However, mortality rate is about 5% to 30% in high-risk patients such as the elderly [5]. In recent years, Percutaneous Cholecystostomy Tube (PCT) placement has become a feasible choice for acute management in patients age 50+ with complicated presentation and multiple comorbidities which deems the patient a poor surgical candidate [6].

Multiple studies have shown that high-risk patients with acute cholecystitis and the presence of multiple comorbidities are generally treated with PCT [3,5,7], while surgical intervention is delayed 6 to 8 weeks [1]. Furthermore, PCT has become a suitable option for patients with delayed presentation [8], likely due to the association with increased morbidity and mortality in both emergent and elective cholecystectomy cases [9].

In a recent study performed in Taiwan [6], several comorbidities in elderly patients with acute cholecystitis were identified with ischemic heart disease and chronic kidney disease as the most significant (p= 0.014) [6]. In decreasing order, hypertension, diabetes mellitus, cerebral vascular accidents (CVA), and chronic obstructive

		Groups						Significance
		No Surgery		Surgery		Cholecystitis tube		
		Count	Column N %	Count	Column N %	Count	Column N %	
Gender	Male	3158	53.70%	3920	63.20%	2227	56.70%	<.001
	Female	2724	46.30%	2281	36.80%	1703	43.30%	
Race	White	3658	62.20%	4272	68.90%	2543	64.70%	<.001
	Non-White	2224	37.80%	1929	31.10%	1387	35.30%	
Median household income national quartile for patient ZIP Code	$1-$35,999	1761	30.50%	1974	32.30%	947	24.90%	<.001
	$36,000-$44,999	1503	26.00%	1464	23.90%	844	22.20%	
	$45,000-$58,999	1335	23.10%	1595	26.10%	965	25.40%	
	$59,000 or more	1172	20.30%	1084	17.70%	1049	27.60%	
Mortality	Alive	4733	80.50%	5740	92.80%	3273	83.30%	<.001
	Died	1149	19.50%	446	7.20%	658	16.70%	
Sepsis	no sepsis	5229	88.90%	4374	70.50%	3357	85.40%	<.001
	sepsis	653	11.10%	1827	29.50%	573	14.60%	
DNR	No DNR	5182	88.10%	5898	95.10%	3416	86.90%	<.001
	DNR	700	11.90%	303	4.90%	515	13.10%	
Age in years at dmission, mean±stdev)		73.70±12.2		71.77±11		74.55±11.5		<0.001
Total charlson Index, mean (±stdev)		4.63±1.9		4.1±1.3		4.55±1.7		<0.001

Table 1: Patient Characteristics of Each Group

		OR	95% C.I.		Sig.
			Lower	Upper	
Gender	male	Reference			
	female	1.52	1.379	1.677	<0.001
Median household income	$1-$35,999	Reference			
	$36,000-$44,999	0.787	0.689	0.9	<0.001
	$45,000-$58,999	0.789	0.692	0.901	<0.001
	$59,000 or more	0.705	0.614	0.81	<0.001
Sepsis	No sepsis	Reference			
	Sepsis	0.693	0.598	0.803	<0.001
DNR	No DNR	Reference			
	DNR	3.815	3.375	4.313	<0.001
Surgical Group	Surgery	Reference			
	No Surgery	2.464	2.174	2.792	<0.001
	Cholecystitis tube	1.867	1.625	2.144	<0.001

*Variables not significant: Age p=0.068, Charlson Score p=0.009, Race p=0.076

Table 2: Regression for prediction of mortality

pulmonary disease (COPD) also contributed [6]. Other important findings show that elderly patients presenting with high American Society of Anesthesiologists (ASA) status is an important variable for choosing adequate management of patients [10,11]. Additionally, most patients with ASA II and IV were treated with PCT [6].

In this study, it was found that DNR status is an independent risk factor for mortality in elderly patients presenting with acute cholecystitis. This finding was present in all patient groups: nonsurgical, surgical, and PCT. In addition, the mortality in the PCT group was higher than the surgical group, which raises concerns as to which treatment modality is more adequate for elderly patients with acute cholecystitis. The impact of having a DNR status at the time of admission, and its impact on physician's decision-making is unknown. Surgery is considered a more invasive and morbid intervention in elderly patients compared to PCT placement, which can lead to more complications that may require resuscitation and intubation. In patients with DNR or DNI status, life-sustaining treatment cannot be performed which could ultimately influence the physicians final decision to take the patient to the OR.

Interestingly, DNR status is usually underreported by hospitals [12]. Furthermore, it has been shown that when DNR orders are obtained during the first 24 hours of hospital stay, it reflects the level of understanding of the patient's baseline health, the complexity of comorbidities, as well as personal preferences in relation to end of life care. Conversely, DNR orders obtained after 24 hours of hospital stay usually reflect the lack of response to therapy more than an overall understanding of the patient's baseline prior to admission [12,13]. When patients have DNR status early in the hospital stay, less aggressive interventions can be considered and patient care becomes more individualized. Studies evaluating DNR status in other medical conditions, such as pneumonia, have found that socioeconomic status, cultural, and religious factors affect patient's preferences for resuscitation [14].

This study also showed a low percentage of patients presenting with a known DNR status, which suggests that elderly patients are not having the DNR discussion with their outpatient physician. Both inpatient and outpatient health care providers need to be aware of these scenarios, as unknown DNR status is a negative predictor of mortality. We emphasize the importance of screening in out patient care, especially in patients with multiple comorbidities. In a study performed in Canada that evaluated DNR status and DNR overall understanding in patients with lung cancer, it was found that patients preferred the discussion about DNR status at the time of diagnosis [15] in the outpatient setting. The same study also showed that patients wanted their physician to decide when to have the DNR discussion [15].

Aronsky D et al. states that in the outpatient setting one possible limitation to addressing patient's preferences regarding DNR status is the lack of an established documentation protocol [16,17]. There is a need for the development of electronic tools that allow healthcare providers to easily access documented goals of care from outpatient discussions. Other limitations reported by primary care providers include lack of training, time-limited encounters, and prognostic uncertainty [18].

Conclusion

To our knowledge, no previous studies have evaluated associations between DNR status and mortality rates in patients age 50+ presenting with acute cholecystitis. There is literature supporting high mortality among patients with DNR orders who have surgery performed. However, there is insufficient data to guide the use of more or less intensive interventions such as cholecystectomy in patients with DNR status and limited life sustaining treatments. In this study, patients with DNR status who received cholecystectomy had a lower mortality than PCT placement, which is considered the standard of care in critically ill elderly patients presenting with acute cholecystitis. Our study follows studies in other specialties like patients with hip fractures that DNR status is independently associated with mortality [19]. Previous studies indicate patients with DNR status may have less aggressive medical care which may contribute to increased death [21]. The reason behind less invasive procedures is likely due to the baseline complexity of patient's disease and forming treatment plans aligning with patient's wishes.

Further research is necessary to gain a better understanding of this variable. This is important because it allows physicians to determine aggressive treatment in the older patient and the necessity to adhere to goals of care of patients [21]. Moreover, as modern technologies that prolong life and survival emerge, and the elderly population keeps growing, end-of life issues discussions in primary care become essential in decision-making and outcomes in the acute setting.

Conflict of Interest

No conflict of interest to declare

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