Modified Frailty Index as a Predictor of Mortality and Contralateral Amputation After Primary Amputation

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INTRODUCTION:

- In patients with progressive chronic limb ischemia (CLI) there is an increased risk of amputation that results in loss of functional status and subsequent frailty.
- The modified frailty index score (mFI-5) has been used for risk stratification in patients undergoing various orthopedic surgeries and its ability to predict adverse outcomes[1].
- **This study aims to investigate if mFI-5 can be used as a predictor of contralateral amputation and mortality in patients who undergo primary lower extremity amputation (LEA) secondary to CLI.**

METHODS:

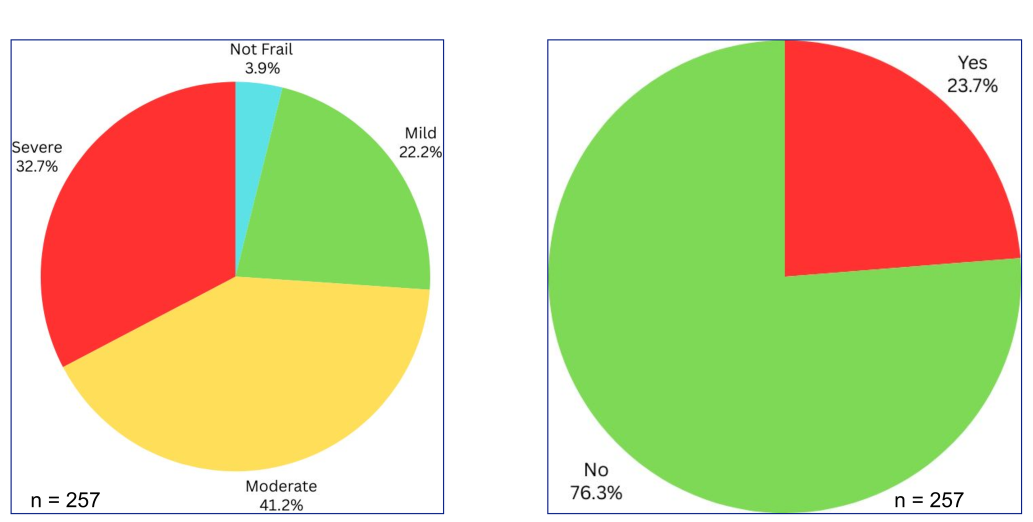
We completed a retrospective review of 693 patient charts who underwent primary amputation at a major tertiary facility from 2015 to 2022. Inclusion criteria consisted patients who underwent above knee or below knee amputation due to CLI. We recorded incidence and timing of primary and contralateral amputation (n=47) along with demographics, components of mFI-5, subsequent stratification, and mortality. We performed statistical analysis using Chi-Squared tests and multivariate logistic regressions using a p-value <0.05 to indicate significance to investigate how these factors affected our primary outcomes: contralateral amputation and mortality rate at 1 year.

Critical Limb Ischemia

This pathology is defined as a clinical syndrome characterized by ischemic pain at rest and/or ischemic tissue loss such as non-healing ulcers or gangrene related to peripheral arterial disease in the lower extremities[2]. Endovascular and open surgical treatments for revascularization are attempted first, however when these options fail, amputation must be considered. Major amputations limit function independence, can increase comorbidity burden and increase mortality rates. At two years, 15% of patients with successful BK amputations will have an AK conversion, 15% will receive a contralateral amputation and 30% will be dead[3].

Modified Frailty Index

The mFI-5 was created by using American College of Surgeons NSQIP data in 2015 to predict mortality, morbidity and postoperative complications. The criteria consist of a history of hypertension, congestive heart failure, diabetes, COPD, and reduced functional status[4]. The presence of these components adds points to this score and subsequent stratifies patients as not frail (mFI=0), mildly frail (mFI=1), moderately frail (mFI=2) or severely frail (mFI≥3).



Figures 1 & 2 Demographic breakdown by frailty status and death <1y after primary amputation.

Figure 3. This 59 yo female patient displays nonhealing left heel ulcer with chronic ischemic rest pain due to peripheral arterial disease. She was offered BKA for pain control. This was a contralateral amputation performed after similar presentation in her right lower extremity.

PREDICTIVE VALUE:

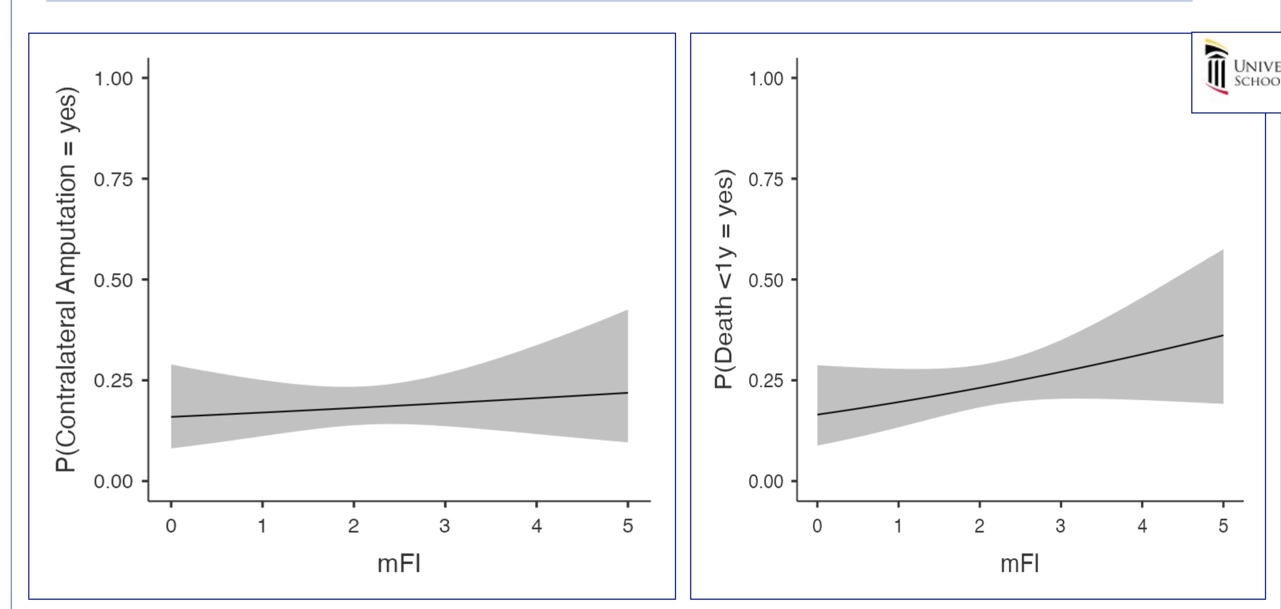


Figure 4. This figure visually represents the predictive value of mFI-5 on contralateral amputations. With a **p-value of 0.634**, mFI-5 did not prove to be a statistically significant predictor of contralateral amputations.

Figure 5. Binomial logistic regression of mFI-5 as predictor of death within a year of primary amputation fails to be statistically significant with a **p-value of 0.162.**

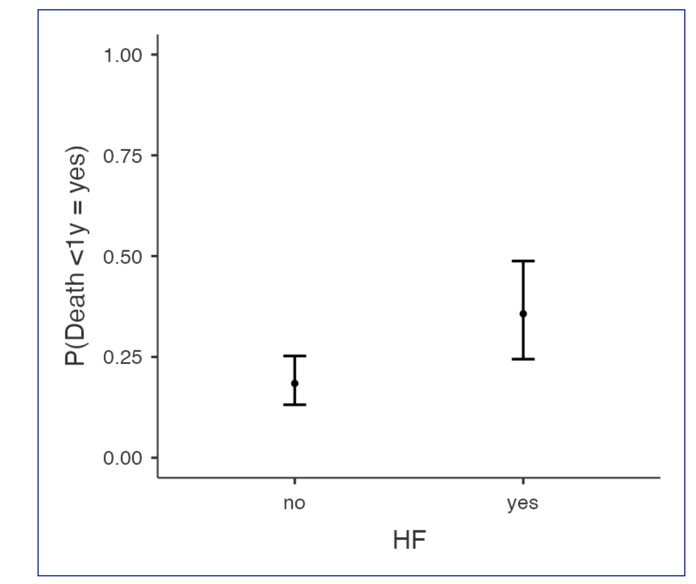
χ^2 Tests

Contralateral Amputation		Value	df	p
no	χ^2	0.979	3	0.806
	N	210		
yes	χ^2	9.829	3	0.020
	N	47		
Total	χ^2	3.651	3	0.302
	N	257		

Figure 6. Chi-Squared Test of Association shows that in patients who did receive a contralateral amputation, frailty status determined by mFI-5 calculation is related to the primary outcome of death within a year.

HEART FAILURE:

Figure 7. On its own, mFI-5 was not a valuable predictor of 1 year mortality after primary amputation. However, when the presence of heart failure was included in the calculation of mFI-5, there was a statistically significant predictive value (**p=0.015**) for mortality rates.



PROTECTIVE INTERVENTION:

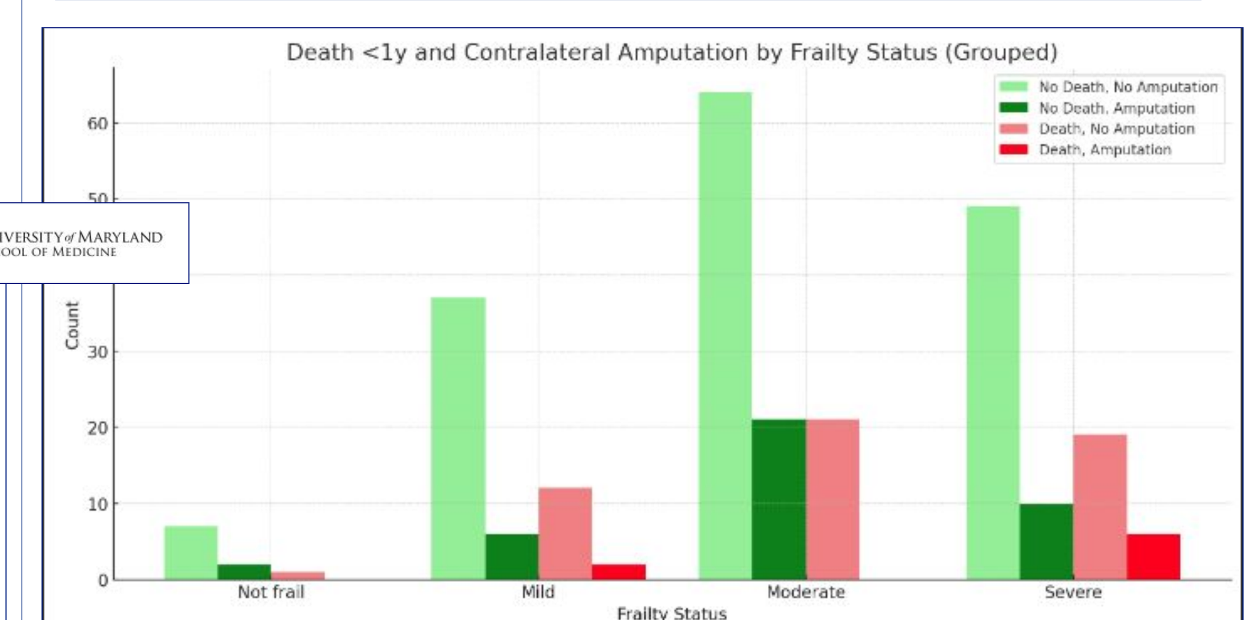


Figure 8. This grouped bar chart shows patients by the presence of primary outcomes when stratified by frailty status. In the moderate frailty category, patients who received a contralateral amputation were protected from 1 year mortality **(p=0.011)**.

TIMING OF AMPUTATION:

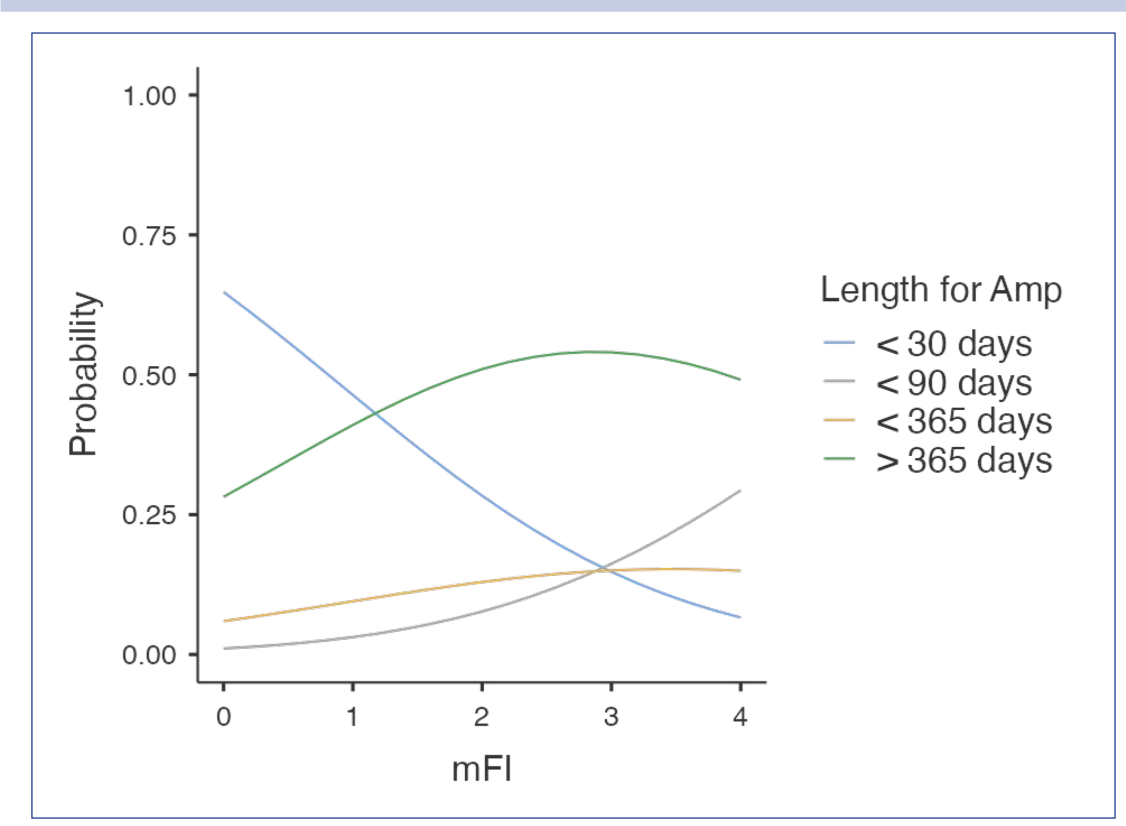


Figure 9. mFI-5 played a statistically significant role in predicting the timing of contralateral amputations occurring within 90 days of primary amputation.

RESULTS:

- 47 (18.3%) patients received contralateral amputations and 61 patients (23.7%) died within a year of amputation. Neither MFI-5 nor frailty status predicted the incidence of contralateral amputations (p=.63 and p=.83).
- In patients who received contralateral amputation, frailty status played a predictive role in 1-year mortality (p=.02).
- In patients with moderate frailty, contralateral amputations were protective against death within a year (p=.011).
- When heart failure contributed to a patient's MFI-5 score, there was an increased risk of mortality in the year after primary amputation (p=.015).
- MFI-5 score predicted patients who underwent contralateral amputations were 4.05 times more likely to undergo procedure within 90 days of primary amputation (4.05, 95% [1.11, 14.79], p=.034).

CONCLUSIONS:

1. The Modified Frailty Index can be a useful tool in predicting mortality in contralateral amputations secondary to CLI . Its predictive capability shows potential for risk stratification during perioperative planning and the optimization of patient care.

REFERENCES:

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