

# Handgrip strength as a predictor of post-operative outcomes following hip fracture

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## Background

- Hip fractures have a significant impact on long-term mobility and independence
- The **Nottingham Hip Fracture Score (NHFS)**<sup>1</sup> is widely used to predict 30-day mortality, but its use in predicting other outcomes is unclear
- Sarcopenia describes a gradual, progressive decline in skeletal muscle mass and strength, and is a major risk factor for falls, fracture and mortality
- Handgrip strength (HGS)** is a validated marker of sarcopenia; it is not routinely assessed in hip fracture patients, despite being a simple and reliable tool that may identify high-risk patients

## Aims

- To assess whether sarcopenia (diagnosed by HGS) can independently predict post-operative outcomes in hip fracture patients
- To assess if sarcopenia can improve discrimination for adverse post-operative outcomes when added to the NHFS

## Methods

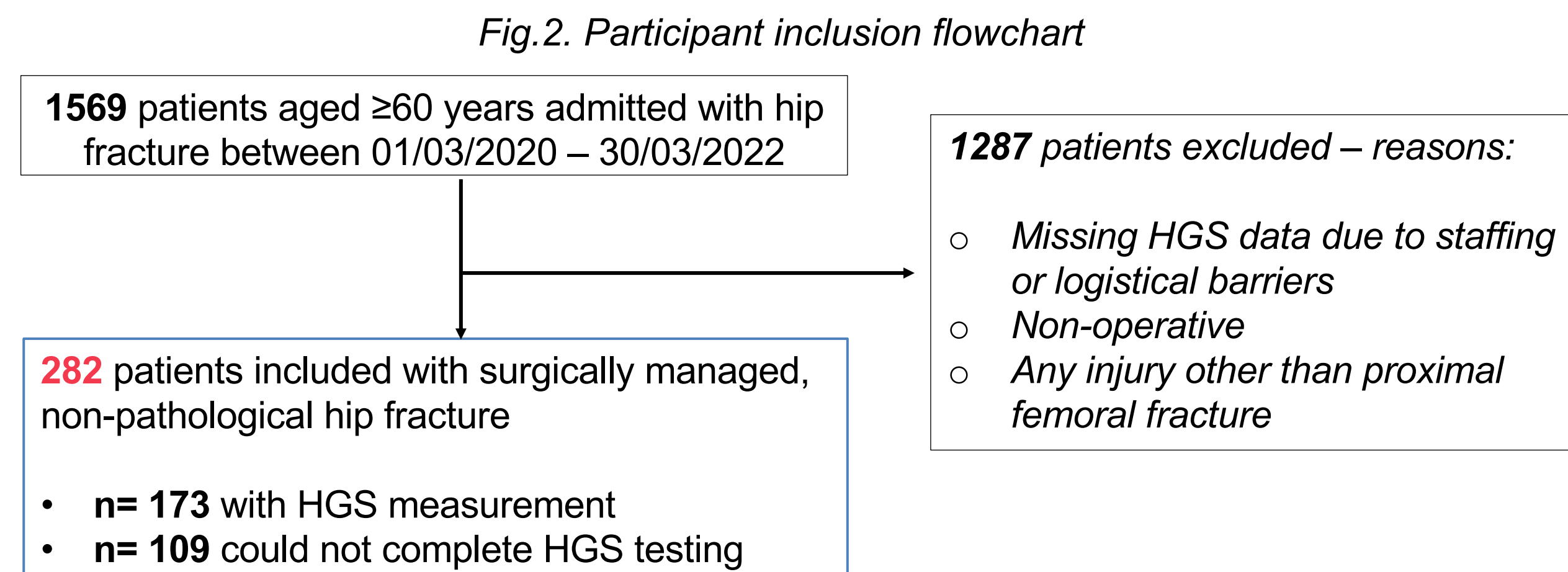
- Analysis of routinely collected clinical data from Northumbria Healthcare NHS Foundation Trust using the National Hip Fracture Database (NHFD)
- HGS measured using a hand dynamometer, maximum score recorded in kilograms across 4 values (2 per hand)
- Sarcopenia status assigned using European Working Group (EWGSOP2)<sup>2</sup> cut-off points for probable sarcopenia:

HGS <27kg in males or <16kg in females

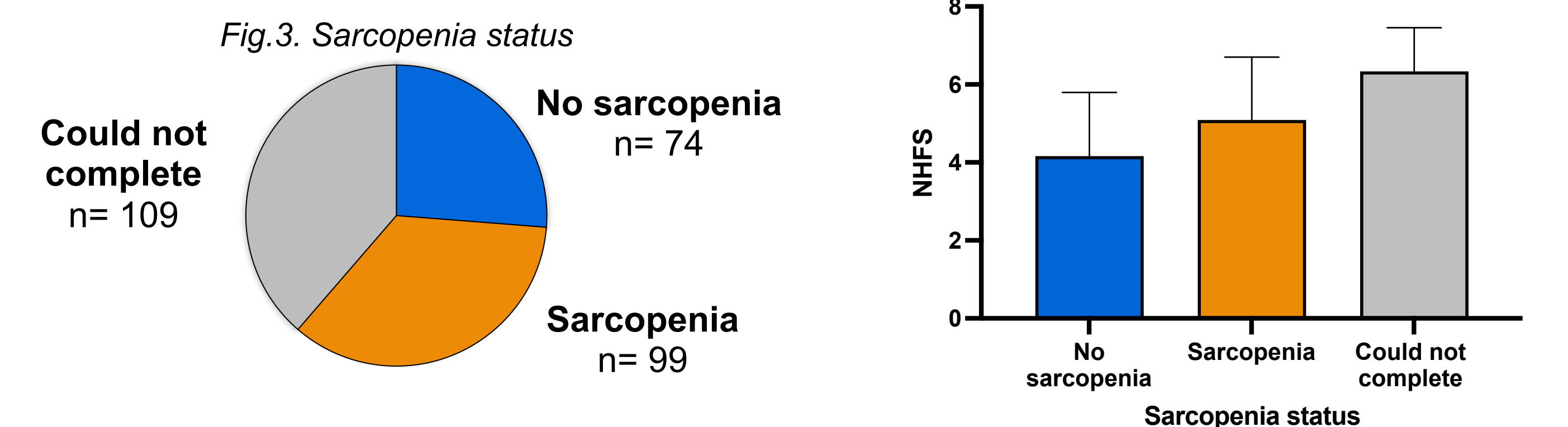
- Patients who attempted but could not complete HGS testing were included as a sub-group
- Outcomes:** 120 day mortality, 120 day residential status, 120 day mobility, prolonged length of stay (>15 days) and post-operative delirium (4AT score ≤72h following surgery)
- Outcome prediction analyses using binary logistic regression & receiver operating characteristic (ROC) curves. C-statistics produced to quantify prognostic value



## Results – Study participants

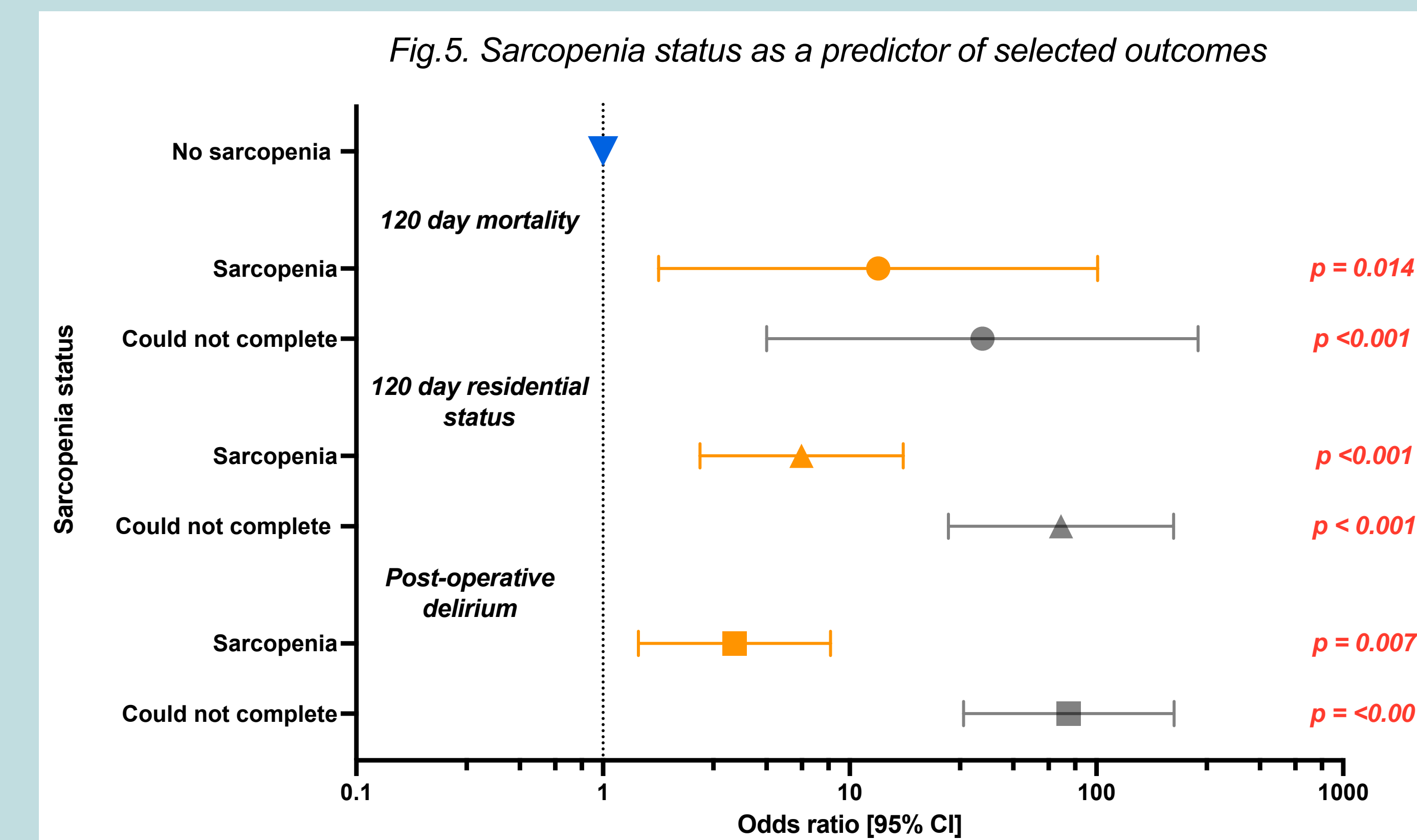


- Mean age 83.2 years (+9.2); 200 (70.9%) were female
- Sarcopenia and inability to complete HGS testing are associated with a higher NHFS score (Fig 4)**



## Results – Sarcopenia alone

- Sarcopenia** was associated with **higher post-operative mortality, not residing in one's own home, poorer mobility and a higher prevalence of post-operative delirium (Fig 5)**
- Presence of sarcopenia was **not** associated with prolonged length of stay (data not shown)
- Inability to complete HGS testing** was associated with **higher risk of adverse outcomes** than presence of sarcopenia or no sarcopenia (Fig 5)



## Results – Sarcopenia added to NHFS

- The NHFS alone is a good predictor of mortality, residential status, mobility and delirium (Table 1)
- When added to the NHFS, **sarcopenia status improves discrimination for: post-operative residential status and delirium (Table 1)**
- When added to the NHFS, **sarcopenia status does not improve discrimination for: post-operative mortality, mobility and prolonged length of stay (Table 1)**

Table 1. Combined NHFS + Sarcopenia status as a predictor of outcomes~

	C-statistics [95% Confidence Interval]				
	Mortality	Residential status	Mobility	Prolonged LOS (>15 days)	Delirium
NHFS	0.75 [0.68-0.82]	0.82 [0.76-0.87]	0.88 [0.82-0.94]	0.58 [0.51-0.65]	0.78 [0.73-0.84]
NHFS + Sarcopenia	0.79 [0.73-0.86]	0.89 [0.85-0.94]	0.87 [0.80-0.94]	0.60 [0.53-0.67]	0.91 [0.87-0.94]
Can Sarcopenia predict outcomes?	Yes	Yes*	Yes – inability to complete test	No	Yes*
Does Sarcopenia add prognostic value to NHFS?	No	Yes	No	No	Yes

~Mortality, residential status and mobility assessed at 120 days post-operatively. Delirium assessed using 4AT rapid clinical test ≤72 hours post-operatively. LOS = length of trust stay

\*Inability to complete HGS test is associated with significantly higher risk of adverse outcomes than sarcopenia or no sarcopenia

## Conclusion

- Sarcopenia diagnosed using handgrip strength measurement** may be a useful predictor of post-operative outcomes in hip fracture patients
- Inability to complete grip strength testing** is also potentially an important indicator of poor prognosis
- Grip strength testing could provide **additional prognostic value to the NHFS** for a range of outcomes

### References

- Maxwell M, Moran C, Moppett I. Development and validation of a preoperative scoring system to predict 30 day mortality in patients undergoing hip fracture surgery. *British Journal of Anaesthesia*. 2008;101(4):511-517.
- Cruz-Jentoft A, Bahat G, Bauer J, Boirie Y, Bruyère O, Cederholm T et al. Sarcopenia: revised European consensus on definition and diagnosis. *Age and Ageing*. 2019;48(1):16-31.