

Understanding the secondary care characteristics and pathways of multiple myeloma patients who reach second line therapy using the Hospital Episode Statistics (HES) database

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INTRODUCTION

Multiple myeloma (MM) is a haematological malignancy that represents 2% of all new cancer diagnoses in the United Kingdom (UK) and accounts for 2% of all cancer deaths. (1) The past two decades have seen notable improvements in the life expectancy of patients with MM, driven by novel therapeutic agents, increased use of autologous stem cell transplants and intensified supportive care. However, there is a lack of published information about the pathway followed by MM patients in the UK and its associated resource impact on the NHS.

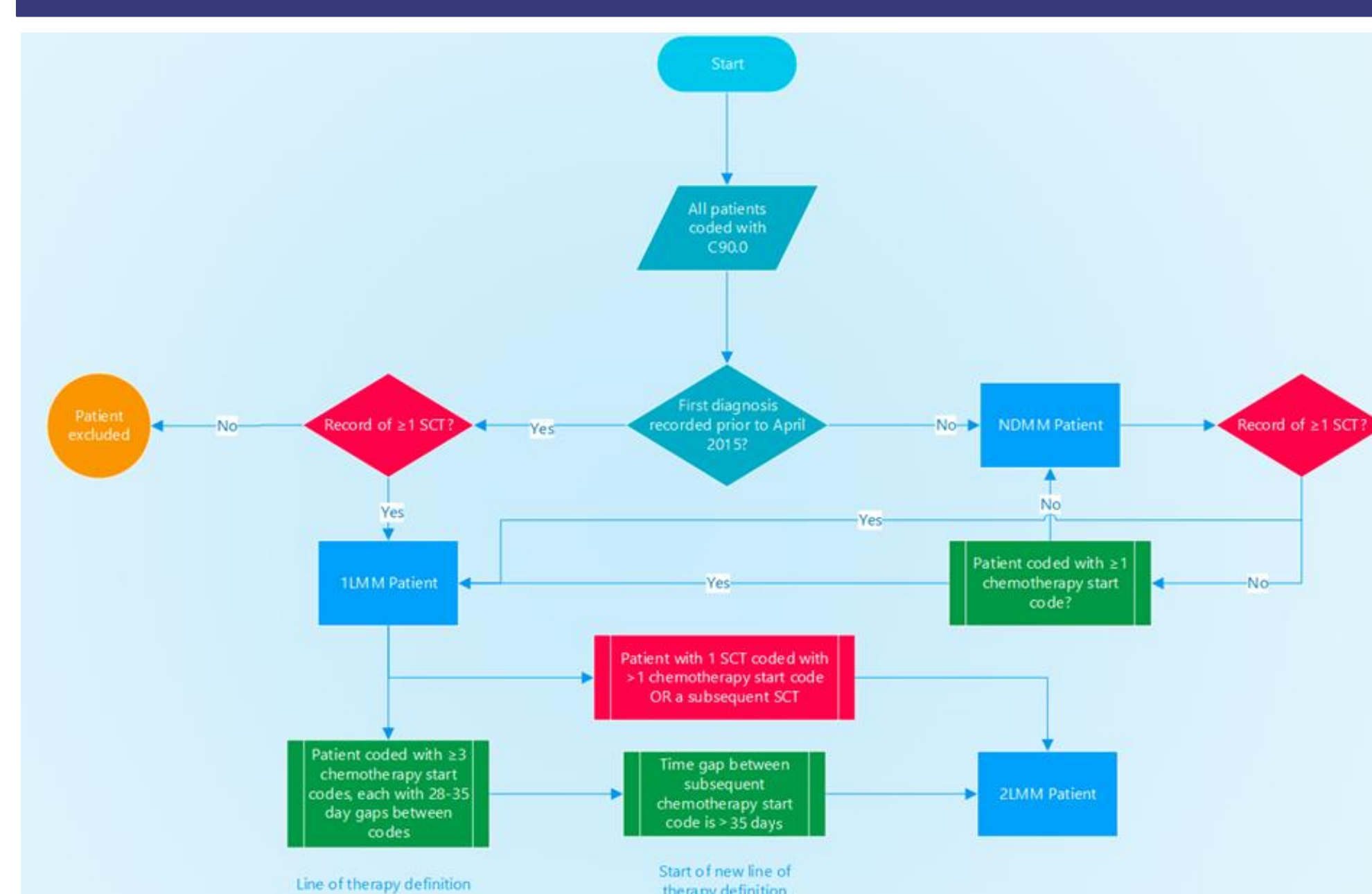
OBJECTIVES

To use longitudinal patient-level Hospital Episode Statistics (HES) data for England to understand the demographics, clinical characteristics, and secondary care burden of MM up to and including second-line (2L) therapy.

METHODS

- Six years of HES data (April 2014-May 2020) were accessed to extract all inpatient, outpatient, and A&E episodes of patients aged 16 or over and with an MM diagnosis ICD-10 code, C90.0.
- As lines of therapy (LOT) and drug regimens are not reported in HES, an algorithm was developed to identify newly diagnosed multiple myeloma (NDMM) patients and chemotherapy OPCS-4 codes were used to identify cycles of therapy at an individual patient level and track movement of patients from first line (1LMM) to second-line (2LMM). Patients in the dataset prior to 2015 were categorised on the basis of stem cell transplant (SCT) records (Figure 1).
- Those identified as reaching 2LMM were tracked for an additional 12 months to capture their data associated with that line of therapy.

Figure 1: Algorithm used to define 'line of therapy' (LOT) cohorts

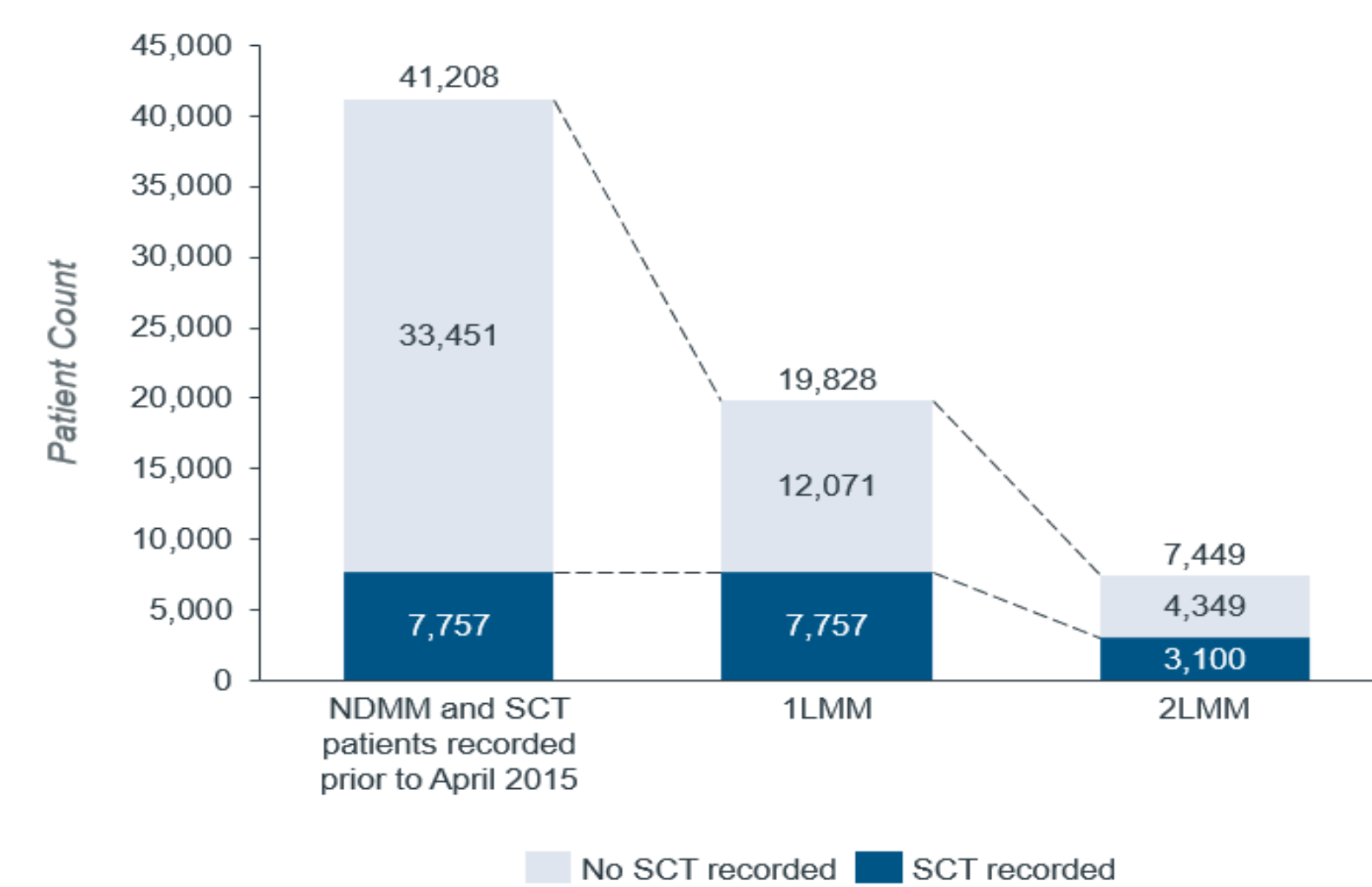


RESULTS

- Between April 2014 to May 2020 a total of 58,481 patients were recorded with a diagnosis of MM. 17,273 patients were identified in 2014/15 and were excluded on the basis that they were recorded with an MM diagnosis prior to April 2015 but had no record of SCT at any point during the analytical time window.
- A total of 41,208 patients were therefore included for analysis. Of these, 48.1% of patients (n=19,828) proceeded to 1LMM therapy and 18.1% (n=7,449) proceeded to 2LMM therapy (Figure 2).
- 39% of patients (n=7,757) at 1LMM and 41.6% of patients (n=3,100) at 2LMM had at least one SCT recorded.

Figure 2: Patient flow from NDMM to 2LMM

The number of recorded SCT are the same in both NDMM and 1LMM cohorts, as SCT is considered part of 1L treatment.



Patient characteristics

- Male patients accounted for 58% of the dataset compared to 41.8% of female patients (Table 1).
- The average age of a NDMM patient was 72.4 years, whereas the average age of patient in the 1LMM and 2LMM cohorts were 69.3 and 66.4 years respectively (Table 1).
- Of the NDMM patients with age recorded, highest proportion of patients were in the 75+ age band (47.2%, n= 15,498) (Figure 3).
- Within the 1LMM and 2LMM cohorts, the proportion of patients falling in the 75+ age band decreased. As a result, the average and median age of patients were lower in subsequent LOT cohorts.

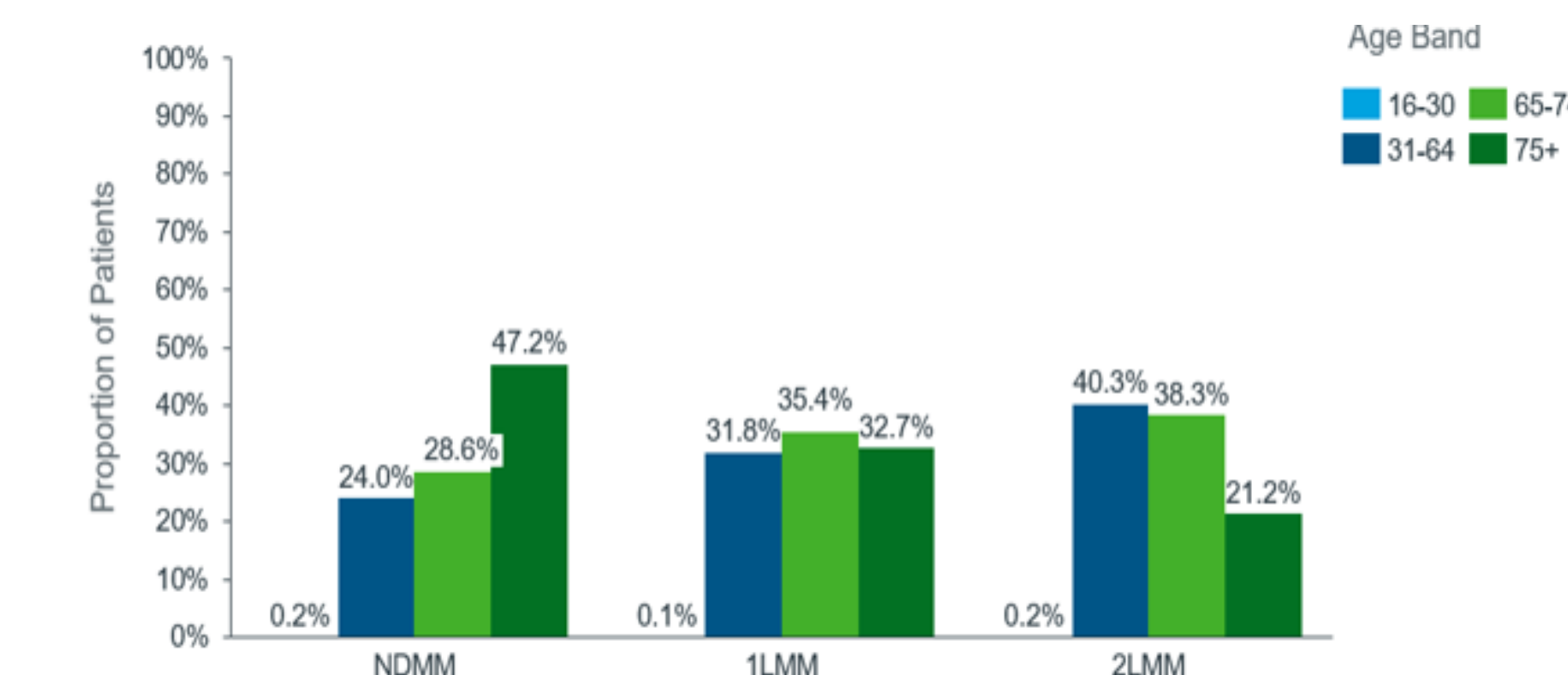
Table 1: Demographic characteristics

Gender at diagnosis†	N (%)
Male	22,267 (57.97%)
Female	16,054 (41.80%)
Not known	89 (0.23%)
Age (years) by cohort‡	Mean (95% CI)
NDMM	72.4 (60.2-84.7)
1LMM	69.3 (57.9-80.3)
2LMM	66.4 (55.6-77.2)

† Excluding SCT patients recorded prior to April 2015 (n=2798)
‡ Patients with no record of an age were excluded. Those with a diagnosis and/or SCT recorded prior to April 2015 were excluded from the NDMM cohort only.

Figure 3: Age band and progression through LOT for the total MM cohort

Patients with no record of age were excluded. Those with a diagnosis and/or SCT recorded prior to April 2015 were excluded from the NDMM cohort only

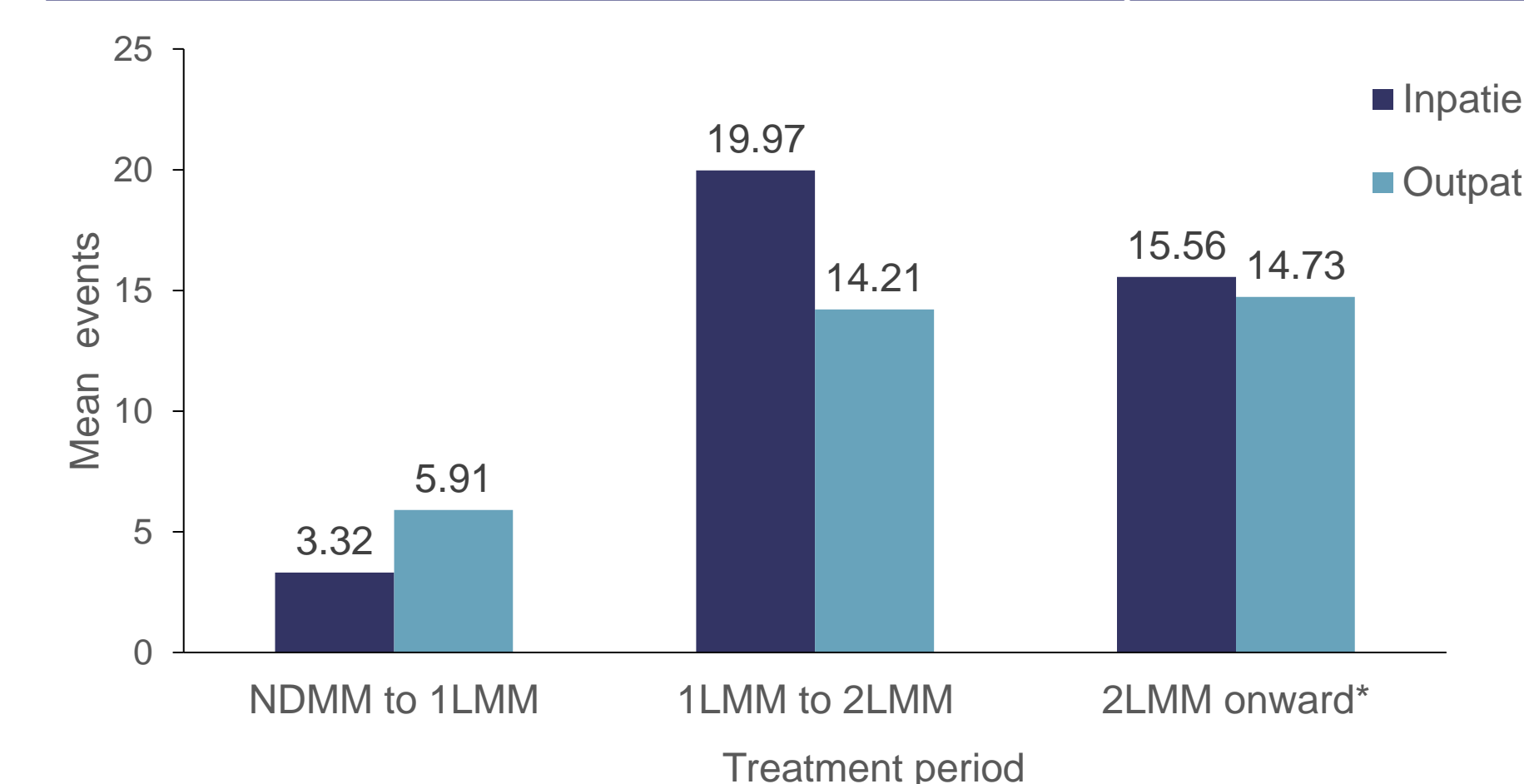


Activity burden

- Between April 2015 and May 2020, patients with a new diagnosis of MM had on average 45.8 appointments related to their MM care, which includes their activity in 1L and 2L treatment.
- Patient contact across both inpatient and outpatient settings increased when moving from the NDMM to 1LMM cohort (Figure 4).

Figure 4: Mean inpatient and outpatient event counts per patient between each time period of treatment

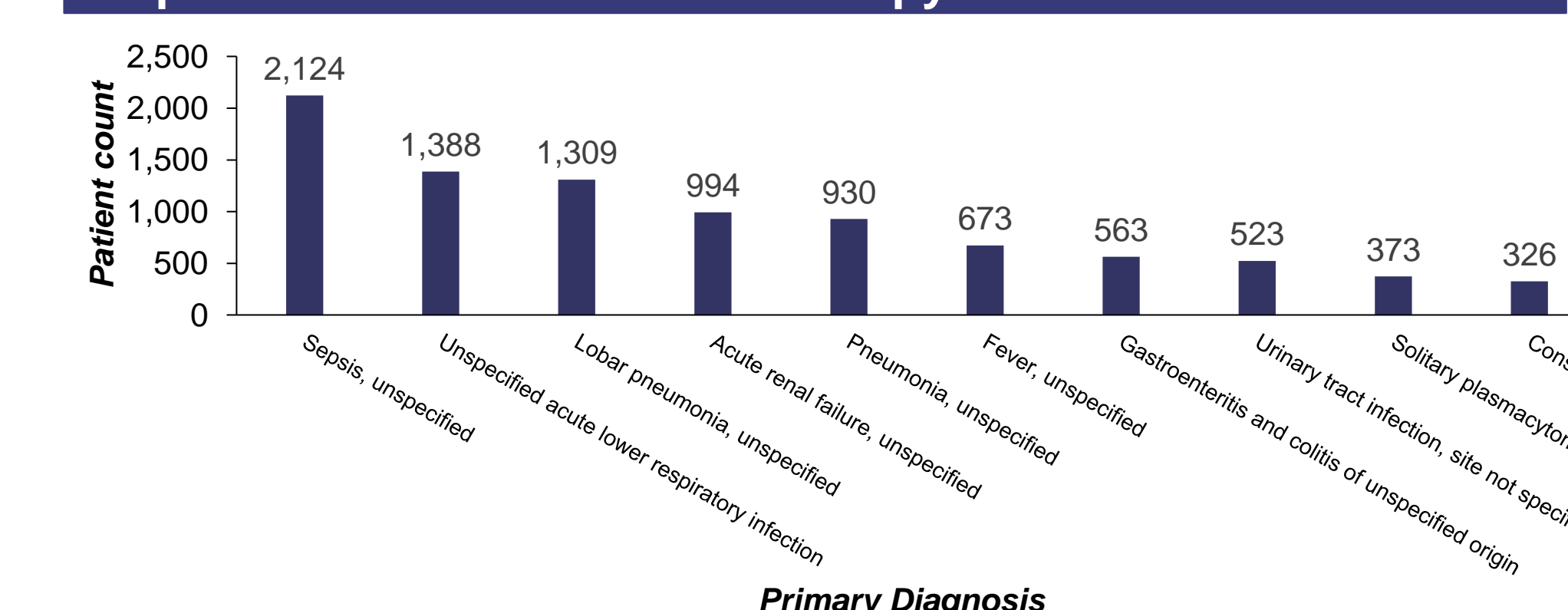
*2LMM cohort was tracked for 12 months following the start of the 2LMM treatment period. Patients with an SCT recorded were excluded from this analysis.



Infections

- Across the NDMM, 1LMM and 2LMM cohorts, infection was recorded in 37.9% (n=14,567), 59.7% (n=11,833) and 73.0% (n=5,441) of patients, respectively.
- Of the top 10 primary event diagnoses recorded after 1LMM therapy initiation, six were related to an infection (Figure 5).

Figure 5: Top 10 common primary diagnosis of inpatient and outpatient events after 1LMM therapy initiation



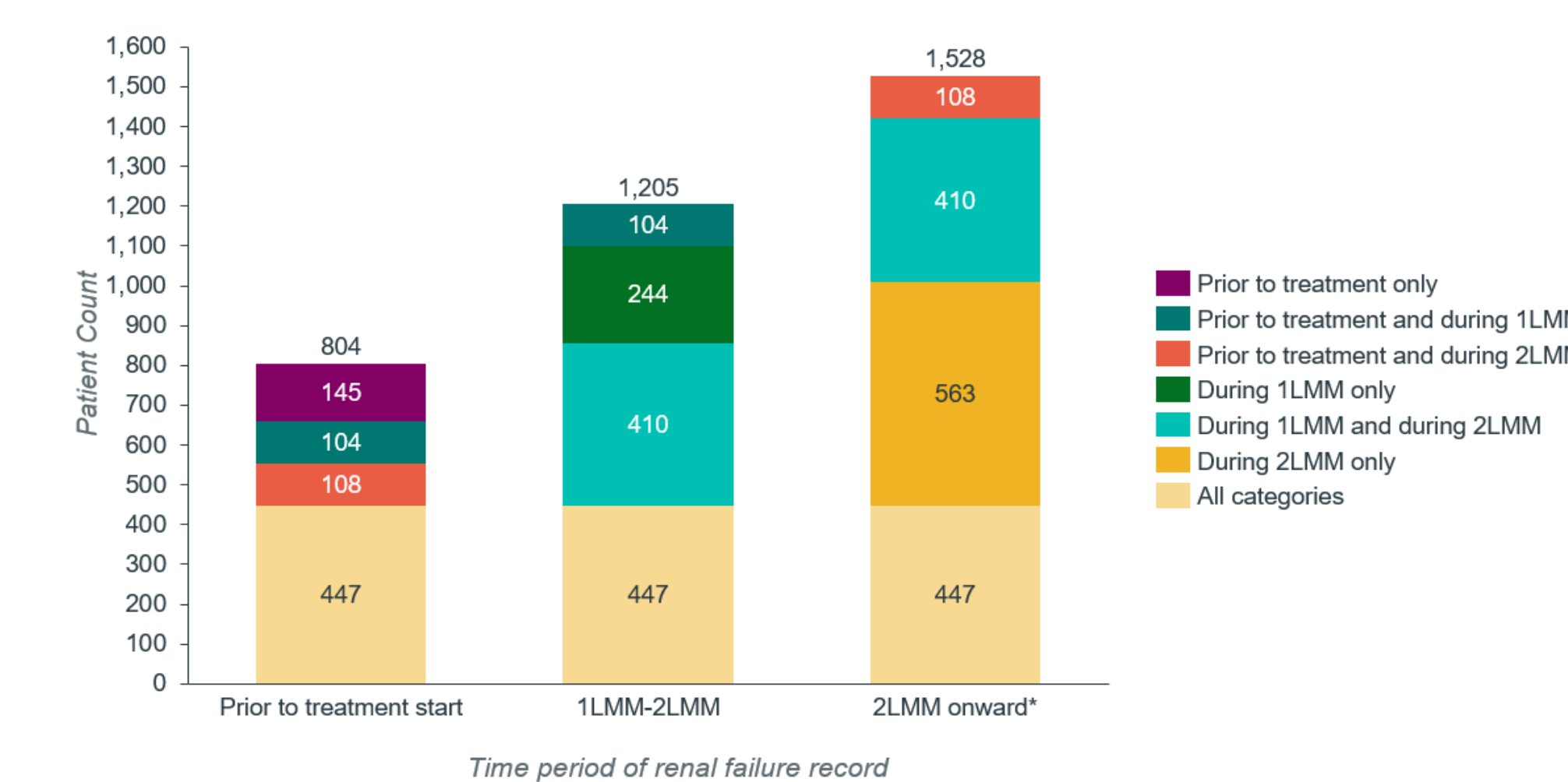
Renal failure

- Across the NDMM, 1LMM and 2LMM groups, renal failure was recorded in 45% (n=17,144), 47% (n=9,527) and 49% (n=3,622) of patients, respectively. Patients who reached 2LMM were tracked across the analytical time window to evaluate at what treatment period renal failure was recorded (Figure 6). 2,101 patients with at least one renal failure event and a time stamp, who reached 2LMM were tracked.
- 145 patients already had a diagnosis of renal failure prior to starting any therapy for their MM and 447 patients remained renally impaired throughout their time in the dataset.

Figure 6: Time period of renal failure* for patients reaching 2LMM

*Any type of renal failure, impairment and insufficiency has been included within the definition of 'renal failure'. This includes both acute and chronic forms. Patients may have a record of renal failure throughout their treatment pathway or at certain points only. Patients with an SCT recorded were excluded from this analysis.

*2LMM cohort was tracked for 12 months following the start of the 2LMM treatment period



DISCUSSION

- To our knowledge, this study is the first to utilise an algorithmic approach in HES to identify and classify MM patients into LOT cohorts and subsequently analyse their characteristics, burden, and resource impact.
- Our findings show that in England, most NDMM patients are older and predominantly male, which supports other published demographic data available for MM patients. (1)
- The decreasing mean age for the 1LMM and 2LMM cohorts compared to NDMM suggests that older patients do not remain alive to access later lines of therapy.
- It should be noted that the same group of distinct patients that reached 1LMM and 2LMM were not individually tracked from NDMM. This is because some patients were categorised as 1LMM based on having a diagnosis and SCT recorded prior to 2015.
- Infections become prevalent after patients start on therapy, with sepsis being the most common after 1LMM therapy. Similarly, a notable increase is seen in inpatient and outpatient events when comparing NDMM to 1LMM and 2LMM. These findings provide further insight into the care needs for these already vulnerable patients and the resource implications as they start treatment for myeloma.

- Renal impairment is a common feature in myeloma patients as the disease results in deposition and accumulation of monoclonal light chains in the renal structures.(2) Our results show that around half of the patients in each cohort had renal failure recorded, and 145 patients in the analysed cohort already had renal failure prior to receiving any treatment for their myeloma.
- This study used an algorithm to bundle patients into LOT based on our understanding of MM treatment and management, however, it may not be sufficiently nuanced to accurately capture the complex nature of MM treatment in the real-world.

CONCLUSIONS

- In the absence of a myeloma registry in the UK, this algorithmic approach applied to HES has provided insight into the characteristics of patients in England, and notably the disease burden and complications associated with MM patients through their interaction with the healthcare system.
- The high comorbidity-related events and secondary-care resource use shown from diagnosis to subsequent LOT, highlights the impact of this disease on health service capacity and further signals a need for novel treatments to improve patient outcomes and reduce hospitalisations.

REFERENCES

1. Myeloma Incidence Statistics. www.cancerresearchuk.org.uk. [Online] https://www.cancerresearchuk.org/health-professional/cancer-statistics/statistics-by-cancer-type/myeloma/incidence#heading=Zero.
2. Dimopoulos, M., Kastritis, E., Rosinol, L. et al. Pathogenesis and treatment of renal failure in multiple myeloma. Leukemia 22, 1485–1493 (2008). https://doi.org/10.1038/leu.2008.131

CONFLICT OF INTEREST & ACKNOWLEDGMENTS

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