Investigating the impacts of comorbid conditons on costs and length of stay in secondary care among adults infected with influenza in England, from 2016 to 2020

RWD114

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Introduction and Objectives

- The burden of influenza varies across time and is affected by variations in circulating strains, population immunity, vaccination coverage and other risk factors including comorbidities and age [1].
- The resulting demand from influenza generates challenges for hospitals across England, particularly in emergency departments. The magnitude of the challenges can be measured in healthcare resource utilisation (HCRU) and related costs to the NHS [2].
- This study explored the impact of the presence of comorbidities on influenza-related hospitalisation costs and length of stay (LOS) in adults

Methods

Study design and study population

- This was a retrospective cohort study with all analyses conducted using the Hospital Episode Statistics (HES) database.
- 42 months of HES data (1st September 2016 to 31st March 2020) were used to extract all **inpatient, day case, and A&E episodes** of adult patients (18+) coded with an influenza diagnosis.
- The following ICD10 codes were used to identify patients with an influenza diagnosis: J09, J10 and J11
- The comorbid conditions prioritised for this study were chronic respiratory disease (CRD), chronic heart disease (CHD), chronic kidney disease (CKD), chronic liver disease (CLD),neurological diseases, diabetes and immuno-suppression.
- These comorbid conditions were selected as they are known risk factors for influenza-related admissions and/or complications, are consistent with published literature [3].
- For patients with one or more comorbid conditions, a concurrent diagnosis relating to the comorbid condition was also extracted. The comorbid status for spells where the patient had one or more of the above comorbid conditions was classified as “with comorbidities” and the comorbid status for all other spells was classified as “without comorbidities”.
- HES data are maintained in the IQVIA Woking office according to strict, best practice information governance protocols, in agreement with NHS Digital.

Analysis

- HCRU variables including number of spells and length of stay (LOS) were extracted from the HES. To distinguish between patients in ICU, ICU admissions were derived from a proxy including any of the following:
  - Any spell with an episode in the Intensive Care Medicine Service specialty (TFC 192)
  - Use of mechanical ventilation or use of oxygen therapy/enrichment
- The following costs were calculated: total spell costs and total hospitalisation costs. To derive total spell costs, hospital admission costs (inpatient and day cases) were calculated using each spell’s Healthcare Resource Group (HRG) code as recorded in the data, in addition to the cost of potential A&E attendances that resulted in a hospital admission.
- Regression analysis was used to quantify the association between the risk factors and each outcome of interest. For each HCRU and cost outcome a multi-level model was fitted to the spell-level data, nested within each patient.
- Descriptive analyses were carried out across the entire study period and by influenza season i.e., September 1st to March 31st between September 2016 to March 2020. Comparative analyses were performed on all spells included within the full study period.

Results

Influenza Economic Burden

- 119,495 patients recorded 126,900 spells, with 86%, 13% and ~0% identified by J10, J11 and J09 ICD-10 codes respectively.
- Overall spells costs for influenza in secondary care were £401M, and an average flu spell cost £3,159 (Figure 1).
- The comorbidities with the highest average spell costs were CRD (£4,340) and CKD (£4,523). Patients with asthma recorded the lowest spell costs (£2,444).
- Comparative modelling analyses supported these findings. Presence of comorbidities was significantly associated with spell cost; the cost for a patient with comorbidities was 214% of the cost for a patient without (Figure 2, see footnotes).

Figure 1. Average (mean) spell costs stratified by age group and presence or absence of at least 1 comorbidity, 2016-2017 to 2019-2020 influenza seasons, England

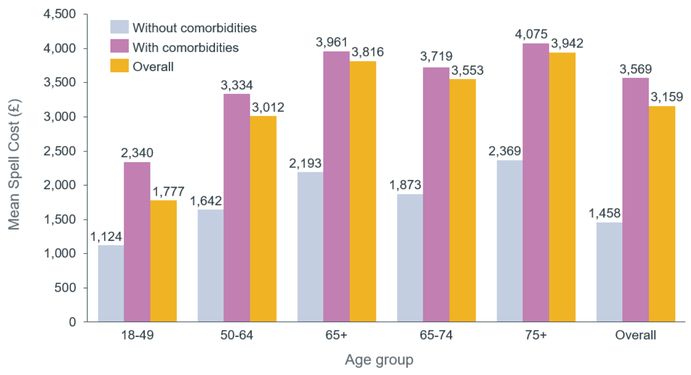
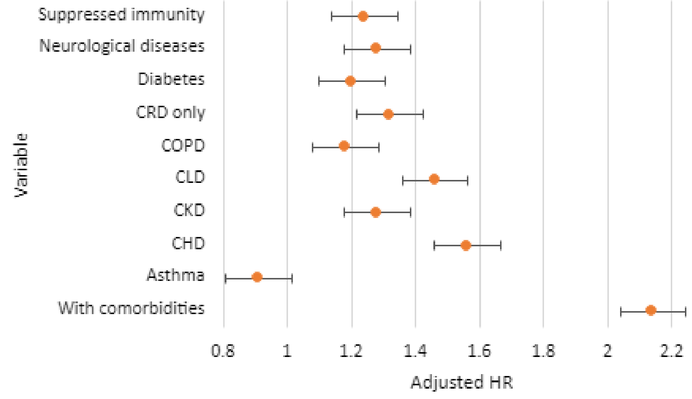


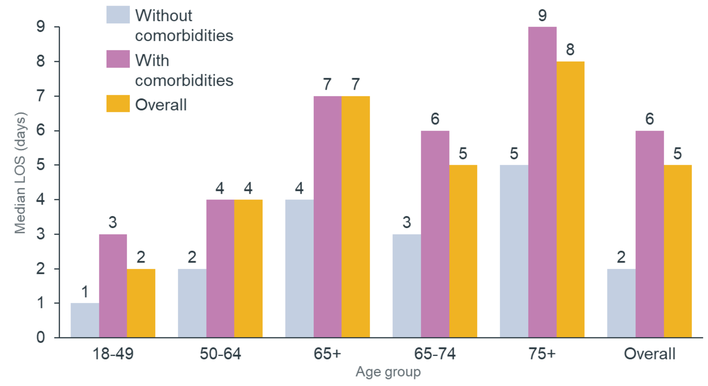
Figure 2. Regression results across all comorbidity groups for spell costs



Length of Stay

- Influenza patients spent 1.12 million days in hospital with seasonal variance of hospital days reflecting those seen in spell and hospitalisation costs, varying from ~127K in 16/17 to ~428K in 17/18.
- As with spells costs, a patients’ age and presence of comorbid conditions increased the median LOS (Figure 3).
- The longest overall median LOS of 8 to 9 days from admission to discharge was recorded for the four most costly comorbid conditions: CHD, CKD, CLD and CRD Only.
- Modelling analyses supported these trends. Across both models, older patients had longer LOS after adjusting for gender and comorbid status.

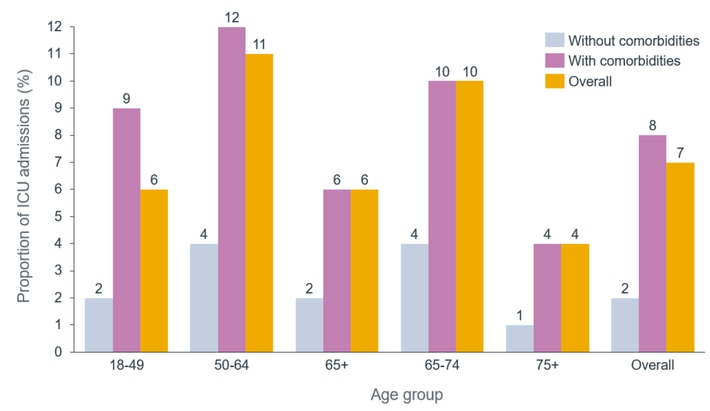
Figure 3. Median LOS split by patient’s comorbid status and age group: : Sept ’16 to Mar ‘20



ICU Burden

- ICU burden was particularly prevalent in the 50-64 age category.
- The proportion of spells with an ICU admission were reported to be 6%, 11%, 10% and 4% respectively in spells of patients aged 18-49, 50-64, 65-74 and 75+ (Figure 4). Patients aged 50–64 had the highest absolute number of ICU admissions and accounted for ~30% of the overall ICU admissions.
- In the comorbid status adjusted model, 50-64 year olds had 1.54 times the odds of being admitted to ICU compared to 18-49 year olds after adjustment, while 65+ year olds only had 0.86 times the odds compared to 18-49 year olds.

Table 4. Proportion of ICU admissions by age group and presence of a comorbid condition: : Sept ’16 to Mar ‘20



- 6.6% of total spells recorded an ICU admission and a total of 114,965 days in an ICU department, with notably more days during seasons 17/18 and 18/19.
- Patients within the 50-64 year old category reported the highest overall median LOS at 9 days overall.

Limitations

- This study would not have captured patients diagnosed with influenza solely within the primary care setting, nor those with influenza-attributable disease but coded with a non-influenza diagnosis code; thereby potentially underestimating the total burden of disease.
- Comorbid conditions included in this study were only those that were recorded during the influenza spell. Therefore, it is possible that patients may be misclassified as “without comorbidities” or as not having specific comorbid conditions when they indeed did.
- Extracting ICU admissions relied on a proxy for identification as this was not directly recorded in HES. The proxy may affect the accuracy but the majority of patients on a form of assisted breathing will require additional clinical oversight in an ICU or similar ward/department, and the estimate of 7% ICU utilisation is consistent with international literature [4].

Conclusion and Discussion

- **The study found a significant difference in hospital burden, including length of stay and intensive care admissions, between influenza patients based on age and comorbid status. In addition, ICU burden was particularly prevalent in the 50-64 age group.**
- **The study demonstrates the effect of both age and comorbid conditions on increasing the hospitalisation costs related to influenza in secondary care. It strengthens the value of annual immunization for those in at-risk clinical groups in order to reduce the clinical and economic burden.**

References

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Footnote 1. Reference group is those without comorbidities. HR adjusted for age group, gender and interaction between age and comorbid status
Footnote 2 Reference group for each comorbid condition were the patients without the mentioned comorbidity. HR adjusted for age group and gender