Estimating The Risk Of Mortality Attributable To Late HIV Diagnosis Following Admission To The Intensive Care Unit: A Single-centre Observational Cohort Study

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BACKGROUND

- Despite improvements in the survival of people with HIV admitted to the intensive care unit (ICU), late diagnosis continues to be an acknowledged risk factor for in-ICU mortality.[1]
- It is important to quantify the potentially preventable deaths among people with HIV in ICU that are attributable to late diagnosis in order to inform public health efforts aimed at earlier HIV diagnosis.[2]
- Here we estimate the risk of in-ICU mortality associated with, and attributable to, a recent late diagnosis in the period leading up to ICU admission using data from a cohort of people with HIV admitted to the Royal Free Hospital (RFH; London, UK) ICU.

METHODS

- Retrospective study (2000-2019) using data on index ICU admissions among people living with HIV.
- Recent late diagnosis was a CD4+ T-cell count <350 cells/mm^3 and/or AIDS-defining illness at/within 6 months prior to ICU admission (**Figure 1**).
- We compared the following characteristics by recent late diagnosis group using Wilcoxon-rank-sum/Chi-squared/Fisher's exact tests:
  - *Demographics:* age, sex
  - *Clinical status:* Acute Physiology and Chronic Health Evaluation (APACHE) II, primary diagnosis
  - *HIV factors:* advanced HIV (CD4+ T-cell count <200 cells/mm^3 and/or AIDS-defining illness at admission), undetectable viral load (VL; ≤50 copies/mL), receipt of combination antiretroviral therapy (cART)
  - *Outcomes:* length of stay (LOS), in-ICU mortality
- Using Poisson regression (robust standard errors, regression standardisation) we estimated unadjusted/adjusted (age, sex, year of ICU admission) risk ratios (RRs) and population attributable fractions (PAFs).

RESULTS

- 207 index admissions were included (median (interquartile range (IQR)) age: 46 (38-53) years; 72% male).
- 58 (28%) were recently diagnosed late, of whom all had a CD4+ T-cell count <350 cells/mm^3 (vs. 73% of those not recently diagnosed late; p<0.001) and 95% had advanced HIV (vs. 57%; p<0.001, **Table**).
- No statistically significant difference in the primary diagnosis distribution at ICU admission identified between the two groups (p=0.14, **Figure 2**).
- Overall, median (IQR) LOS was 5 (2-12) days, and 27% died in ICU. Those recently diagnosed late had a higher median LOS (6 vs. 4 days; p=0.02), with a greater proportion dying in ICU (38% vs. 22%; p=0.02).
- After adjustment, recent late diagnosis was independently associated with an increased risk of in-ICU mortality: adjusted RR 1.75 (95% CI: 1.05-2.91).
- Nearly one-fifth of deaths over the study period attributable to recent late diagnosis: adjusted PAF: 17.08% (95% CI: 16.04-18.12) (**Figure 3**).

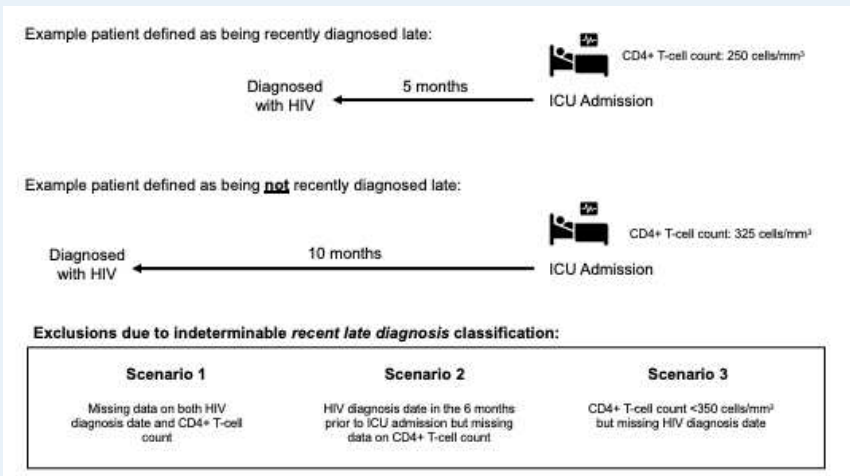

Figure 1. *Schematic defining recent late diagnosis retrospectively from ICU admission*

Characteristic, n (%) or median (interquartile range)	Overall n=207	Not Recently Diagnosed Late n=149	Recently Diagnosed Late n=58	p-value
Demographic Factors				
Age (Years)	46 (38-53)	46 (40-54)	44 (36-52)	0.11
Male (sex at birth)	148 (71.5%)	110 (73.8%)	38 (65.5%)	0.23
Clinical and HIV Factors				
APACHE II score	19 (14-25)	19 (13-25)	21 (14-26)	0.28
Advanced HIV	138 (67.3%)	83 (56.5%)	55 (94.8%)	<0.001
Undetectable VL	90 (45.0%)	85 (58.2%)	5 (9.3%)	<0.001
CD4+ T-Cell Count <350 cells/mm^3 at Admission	164 (80.4%)	106 (72.6%)	58 (100.0%)	<0.001
Receipt of cART	147 (73.5%)	129 (88.4%)	18 (33.3%)	<0.001

[1]Patients were considered to be receiving cART if they had (1) data on cART start date pre-dating ICU admission; or (2) a VL <1000 copies/mL at ICU admission but no cART date.

Table. *Summary of patient characteristics at ICU admission overall and by recent late diagnosis group*

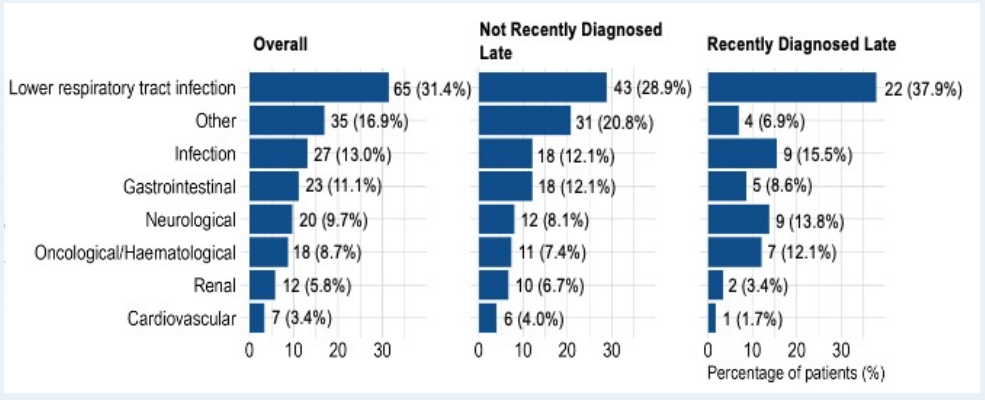

Figure 2. *Summary of primary diagnosis at ICU admission by recent late diagnosis group*

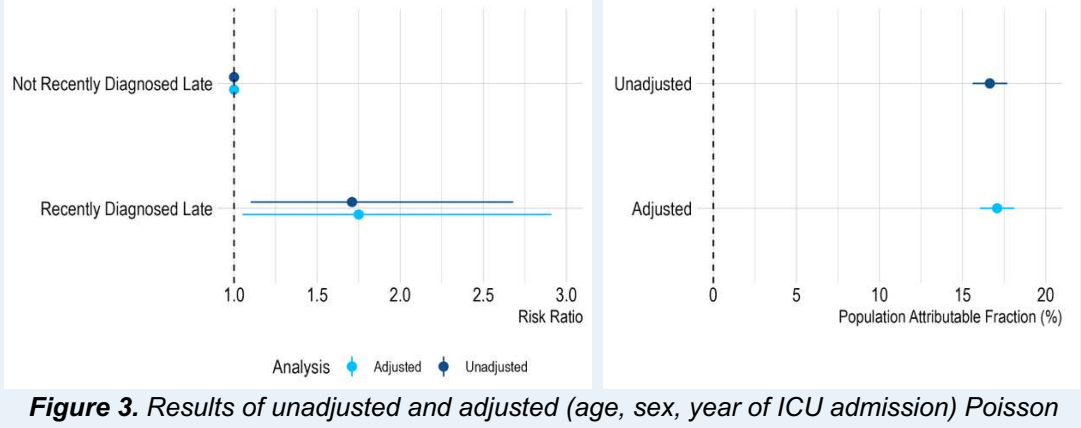

Figure 3. *Results of unadjusted and adjusted (age, sex, year of ICU admission) Poisson regression (robust standard errors, regression standardisation) analyses*

CONCLUSIONS

- We demonstrate that a recent late diagnosis of HIV is associated with an increased risk of in-ICU mortality and that a moderate number of in-ICU deaths among people with HIV admitted to the RFH ICU between 2000 and 2019 can be attributed to recent late diagnosis.
- Our findings support the need for improved public health efforts focused on earlier HIV testing and diagnosis to prevent the progression of HIV resulting in critical illness and potentially avoidable deaths in ICU due to late diagnosis in the cART era and advancements in clinical practice and diagnostic technology.

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