Age-stratified utility of NT-proBNP testing as part of a blind Emergency Department shortness of breath orderset (Jan-Dec 2019).

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INTRODUCTION & PURPOSE

NT-proBNP was added to our emergency department (ED) triage blind 'shortness of breath (SOB) orderset' for presenters aged >70. Evidence-based thresholds for acute heart failure (HF) diagnosis are >900/1800 pg/ml for ages 50-75/>75 respectively (1, 2); their utility in contemporary UK practice is uncertain.

Purpose: To assess the relation between blind NT-proBNP testing in this setting and (1) coded discharge diagnosis stratified by age, and (2) all-cause mortality at medium-term follow-up.

METHODS

We retrieved all ED 'SOB' blood ordersets (1.1.2019–31.12.2019), including NT-proBNP, Hb, electrolytes, creatinine, troponin, CRP, d-dimer, and coded discharge diagnoses. Multivariate logistic regression models for all-cause survival (at 9.9.2021) were assessed.

FIGURE. Histograms of numbers of patients discharged with HF coded in the primary, secondary, or neither discharge diagnosis field for (A) patients aged >=75, and (B) patients aged 50-74, plotted against presenting ln(NT-proBNP).

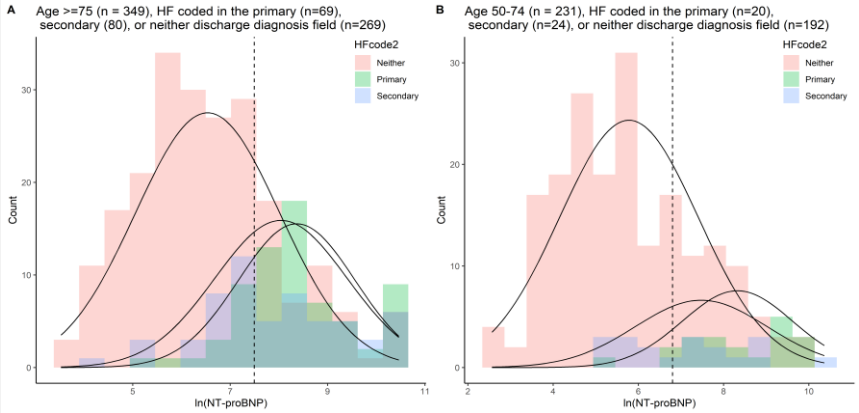

TABLE 1. Characteristics of presentations by age.

Age	All	<60	60-69	70-74	75-79	80-84	>85
Presentation (n), all	638	101	97	90	120	113	116
1st	583	95	90	77	107	100	114
2nd	47	4	6	10	12	12	2
3rd	7	1	1	3	1	1	0
4th	1	1	0	0	0	0	0
HF coded in primary discharge diagnosis field	89 (14.0%)	5 (5.0%)	7 (7.2%)	8 (8.9%)	20 (16.7%)	20 (17.7%)	29 (25.0%)
HF coded in secondary discharge diagnosis field	105 (16.5%)	4 (4.0%)	10 (10.3%)	11 (12.2%)	20 (16.7%)	35 (31%)	25 (21.6%)
HF coded in either field	168 (26.3%)	8 (7.9%)	15 (15.5%)	17 (18.9%)	35 (29.2%)	47 (41.6%)	46 (39.7%)
HF coded in neither field	470 (73.7%)	93 (92.1%)	82 (84.5%)	73 (81.1%)	85 (70.8%)	66 (58.4%)	70 (60.3%)
Median NT-proBNP (IQR), pg/ml	630 (2379)	75 (146)	288 (1423)	448 (1579)	1086 (3013)	1009 (2982)	1712 (3240)
Deceased at follow-up (%)	258 (40.4%)	13 (12.9%)	41 (42.3%)	36 (40.0%)	57 (47.5%)	54 (47.8%)	57 (49.1%)
HF f/u on discharge note	80 (12.8%)	4 (4.0%)	7 (7.4%)	9 (10.1%)	17 (14.3%)	20 (18.2%)	23 (20.9%)
Length of stay, days (IQR)	1 (5)	0 (1)	1 (6)	1.5 (4)	1 (7)	1 (4)	2 (10.5)

TABLE 1 (continued). Lab results by age.

Age	All	<60	60-69	70-74	75-79	80-84	>85
D-dimer (IQR), ug/ml	278 (410)	170 (136)	278 (411)	330 (670)	410 (400)	344 (320)	381 (735)
Trop T (IQR)	21 (29)	7 (8.5)	15 (20)	20 (26)	25 (35)	27 (28)	37 (29)
Hb (IQR), g/dL	126 (28)	138 (18)	130 (31)	127 (25)	121 (32)	120 (23)	121 (21)
Na^+ (IQR), mmol/L	139 (6)	140 (4)	139 (5)	138 (6)	140 (5)	139 (6)	139 (5)
K^+ (IQR), mmol/L	4.3 (0.6)	4.3 (0.6)	4.3 (0.6)	4.4 (0.7)	4.4 (0.6)	4.4 (0.6)	4.4 (0.6)
Ur (IQR), mmol/L	6.5 (4.8)	4.6 (2.6)	6.2 (3.8)	6.8 (4.1)	7.0 (5.2)	7.0 (4.6)	8.5 (5.9)
Cr (IQR), umol/L	83 (47)	73 (23)	78 (34)	84 (54)	88 (64)	92 (52)	94 (53)
CRP (IQR)	11 (31)	7 (20)	14 (49)	10 (29)	13 (42)	11 (34)	10 (22)

RESULTS

There were 638 presentations (median age 76.1), unexpectedly including 198 <70 years. Modal and median lengths of stay were 0 and 1 day respectively.

Stratified by age (<60, 60-69, 70-74, 75-79, 80-84, ≥85y), the proportion with HF coded as primary discharge diagnosis (5, 7, 9, 17, 18, 25% respectively) and all-comer all-cause mortality at 2.2±0.3 years (13, 42, 40, 48, 48, 49%) steadily increased (Table; orderset variables presented as median (inter-quartile range)).

Median NT-proBNP was 3672, 2667, and 321 pg/ml when HF was in the primary, secondary, or neither coded discharge diagnosis field respectively; 2.2-year-all-cause mortality was 54%, 60%, and 35%.

In those with a primary HF discharge code, 77% of 349 presenters ≥75y and 88% of 231 aged 50-74 had NT-proBNP >1800/900 pg/ml respectively. In those without an HF code, 26% in both age cohorts had NT-proBNP>1800/900 pg/ml (dotted lines in Figure, panels A/B, respectively represent NT-proBNP thresholds).

Independent predictors of all-cause mortality for patients with a primary or secondary HF code were ln(NT-proBNP) (OR 1.26, 95% CI 1-1.59) and serum Na^+ (OR 0.93, 0.88-0.99); for patients without an HF code, these were serum K^+ (1.87, 1.21-2.88), ln(NT-proBNP) (1.35, 1.15-1.58), ln(CRP) (1.18, 1.02-1.36), length of stay (1.08, 1.03-1.12), and age (1.03, 1.01-1.06).

CONCLUSIONS

HF detection with NT-proBNP in a blind SOB orderset showed increasing sensitivity with age with the best specificity >75 years. Most presenters stayed ≤1 day, so blind testing at triage facilitates HF detection. NT-proBNP independently predicted 2.2-year-all-cause mortality irrespective of discharge HF coding. This is notable as the commonest non-HF causes of acute SOB are prognostically important at >70 years and follow-up occurred through the Covid-19 pandemic. The findings may reflect disease severity in patients without HF, but also suggest that discharge HF coding status does not identify all those with prognostically relevant HF.

References

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