

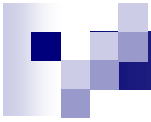


How useful is brain natriuretic peptide?

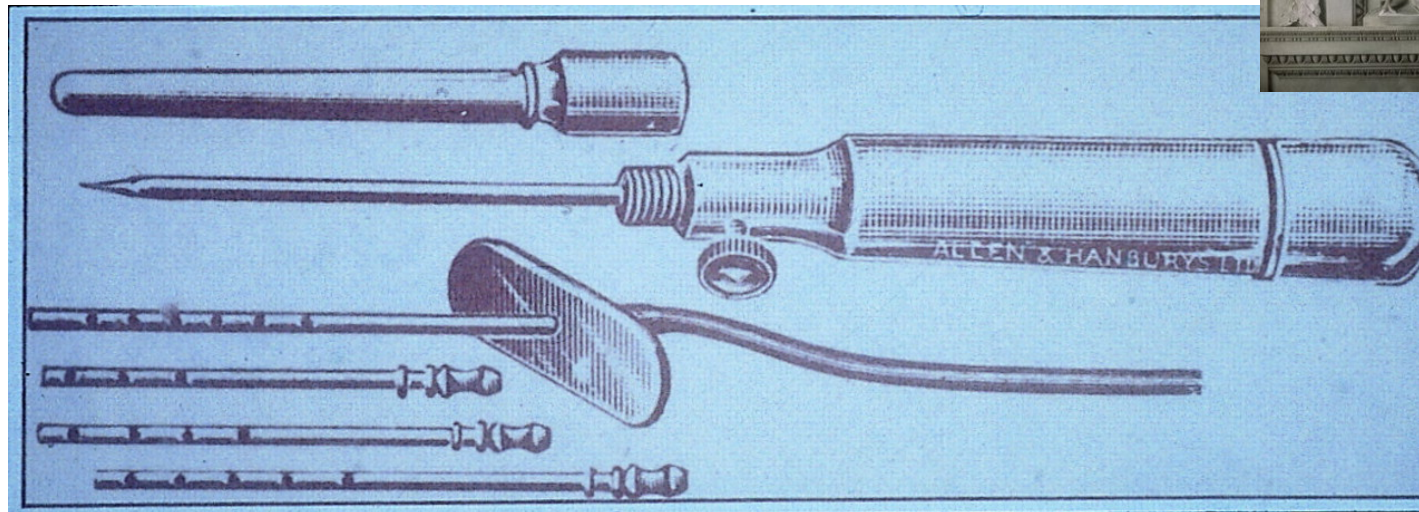
Steven Chung
AT in General and Respiratory
Medicine

An aerial photograph of a coastal town. In the foreground, there are modern buildings, including one with a sign that says "LABBY". A large green field is in the middle ground, with many people gathered there. In the background, a large red and white ship is in the ocean. To the left, a cliff with a lighthouse is visible. The sky is blue and the ocean is dark blue.

**An audit of ordering patterns
at a tertiary teaching hospital**



The good old days





Nature

- BNP was first described in 1988:
 - *“We report here identification in porcine brain of a novel peptide of 26 amino-acid residues, eliciting a pharmacological spectrum very similar to that of ANP, such as natriuretic-diuretic, hypotensive and chick rectum relaxant activities”* Nature. 1988 Mar 3;332(6159):78-81



Brain natriuretic peptide

- Secreted mainly from ventricular cells in response to stretch and tension
- Plasma concentrations are increased in patients with ventricular dysfunction:
 - symptomatic and asymptomatic
 - left and right
 - systolic and diastolic



Objectives

- To review BNP patterns of use in a tertiary level hospital; in particular:
 - how often the results yielded an un-equivocal positive or negative
 - to see how these influenced management



Methods

- Retrospective audit of one hundred patient files at JHH
 - There were 26 repeat tests, so in total 126 BNP results were analysed



Methods

- Patient files were reviewed to assess:
 - Why assays were performed
 - How often results were in the high, low or indeterminate range
 - Whether these results influenced management
 - Duplicate results



Indications for BNP

- Files were divided into three groups according to the indication for ordering;
 - diagnostic
 - confirmatory
 - monitoring of heart failure



- Diagnostic was our group with the most liberal criteria
- Patients had to meet only one of the following criteria to be included



Diagnostic

- Criteria for diagnostic group:
 - *to evaluate dyspnoea in the absence of any symptoms or signs of heart failure*
 - *patient has a high likelihood of heart failure but has co-existing airways disease complicating the diagnosis*
 - *other diagnostic reason (for example, to assist in the investigation of pleural effusions)*
 - *any documented uncertainty about the diagnosis*



- Criteria for the confirmatory group were more stringent
- A patient had to fulfill **all** of the following criteria to be included



Confirmatory

- Criteria for confirmatory group:
 - *known background of heart failure*
 - *presents with symptoms and signs typical of heart failure*
 - *absence of co-existing airways disease*
 - *a high clinical suspicion of heart failure*
 - *no alternate diagnosis*



Monitoring

- Monitoring of heart failure was classified in patients with a diagnosis of heart failure:
 - in whom serial BNPs had been performed in the absence of new symptoms or signs between investigations



Thresholds

- Results were ranked as low, indeterminate and high probability of heart failure based on a literature review:
 - Low probability <100pg/mL
 - High probability >400pg/mL
 - Grey area 100pg/mL – 400pg/mL



Effect on management

- Assessed by comparing treatment commenced on admission with management after results of BNP became available
- An effect was judged to have occurred if there was a change in treatment in concordance with BNP results



Effect on management

- Low BNP, a concordant action =
 - a reduction in heart failure treatment
 - the prompting of further investigation for non heart failure aetiologies
- High BNP, a concordant action =
 - an increase in heart failure treatment
 - the prompting of a reduction in further investigations

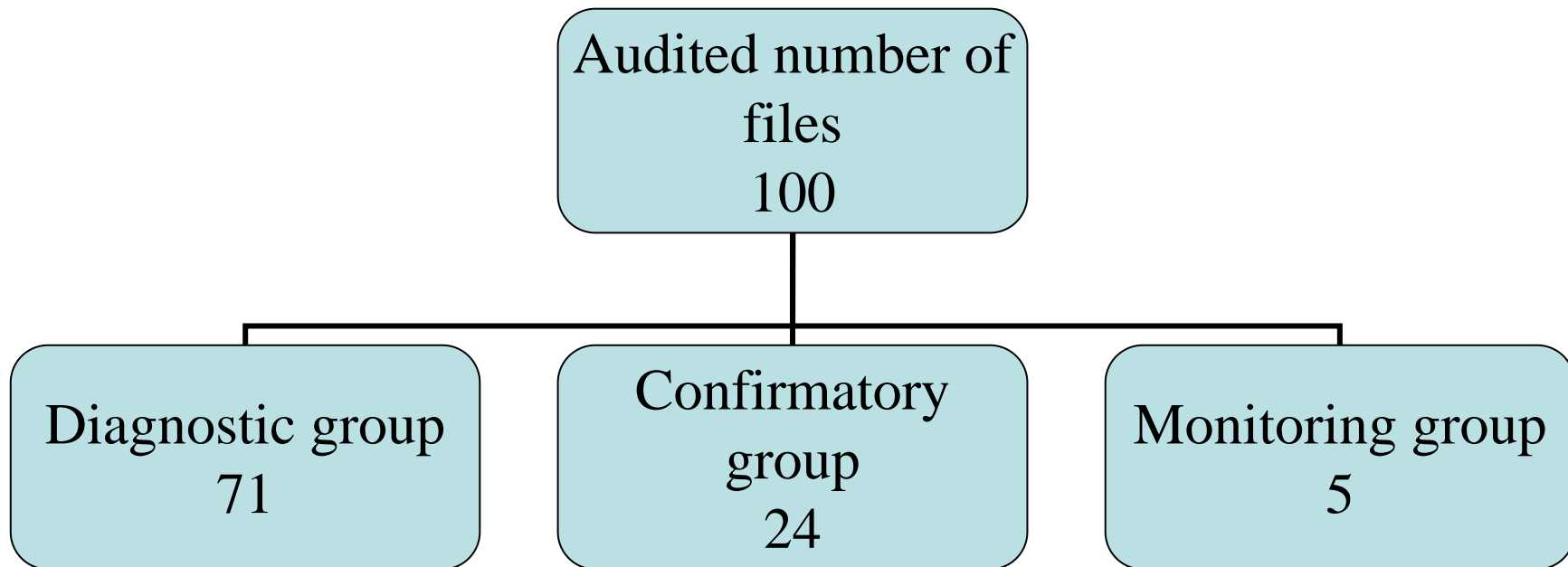


Results: Patient characteristics

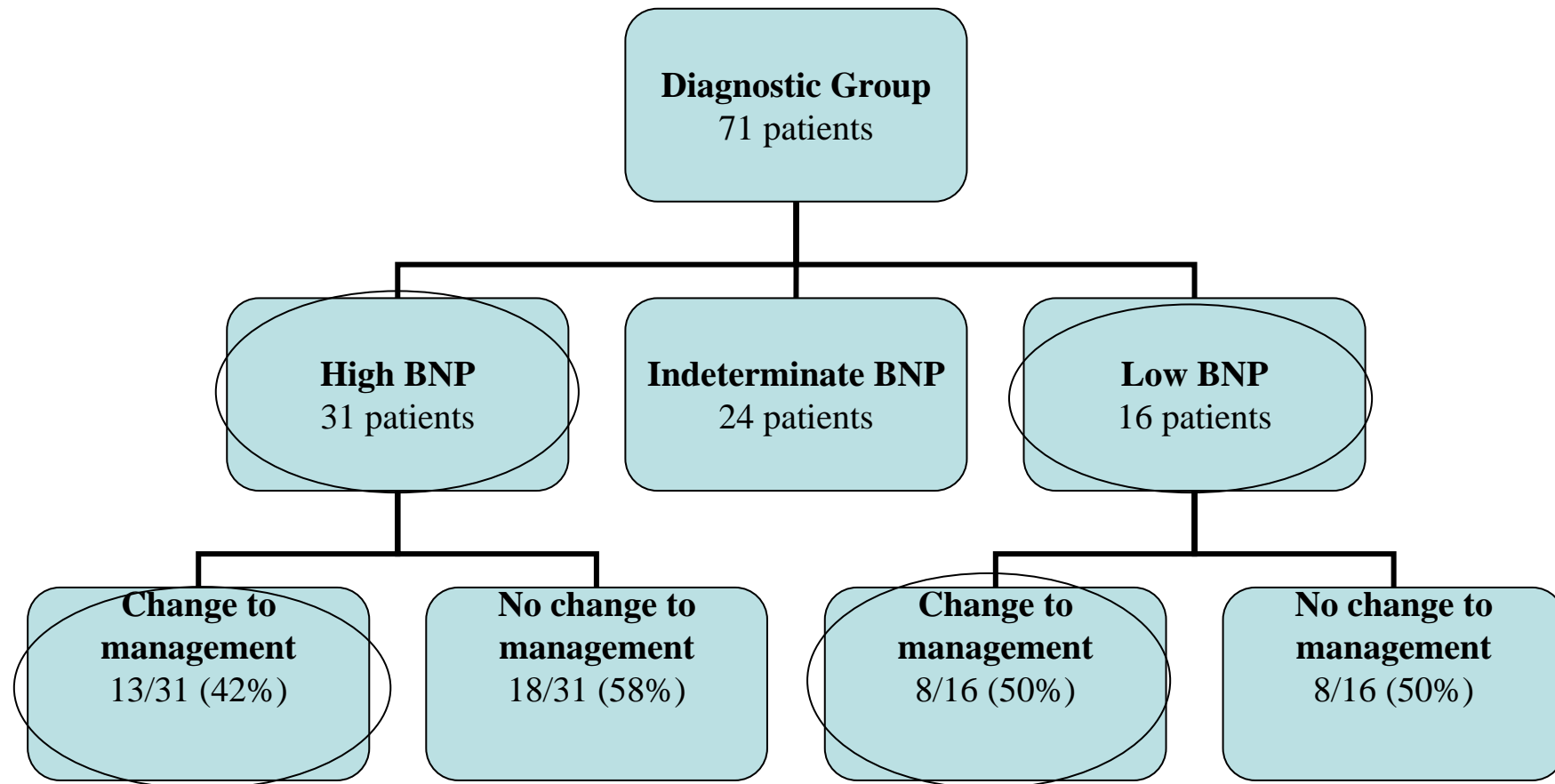
Male	49/100
Female	51/100
Mean age	74.6 (+/- 14.2) years
Known heart failure clinically diagnosed	25/100
Known heart failure confirmed by echo	32/100
Known airways disease	36/100



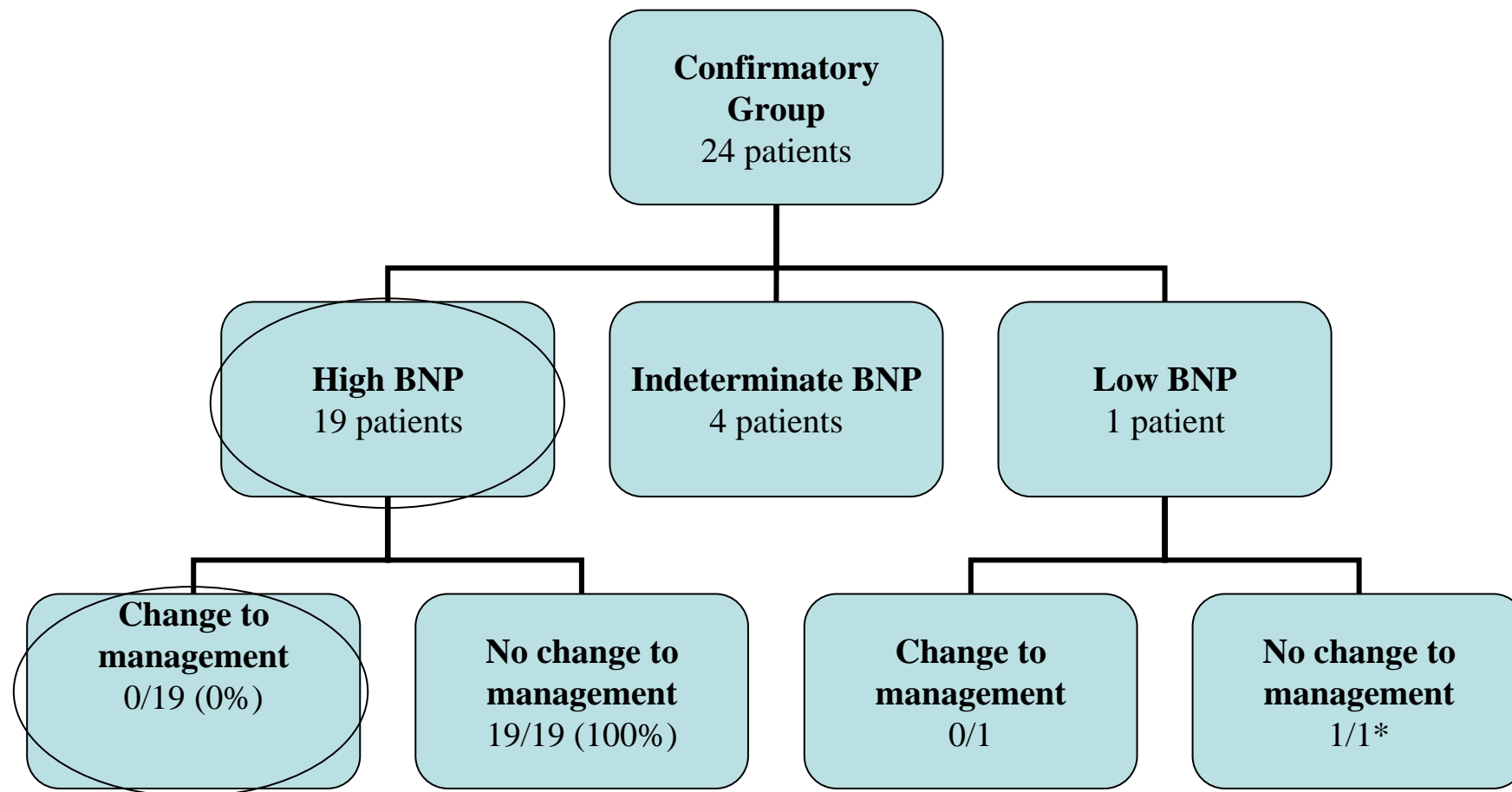
Distribution of indications



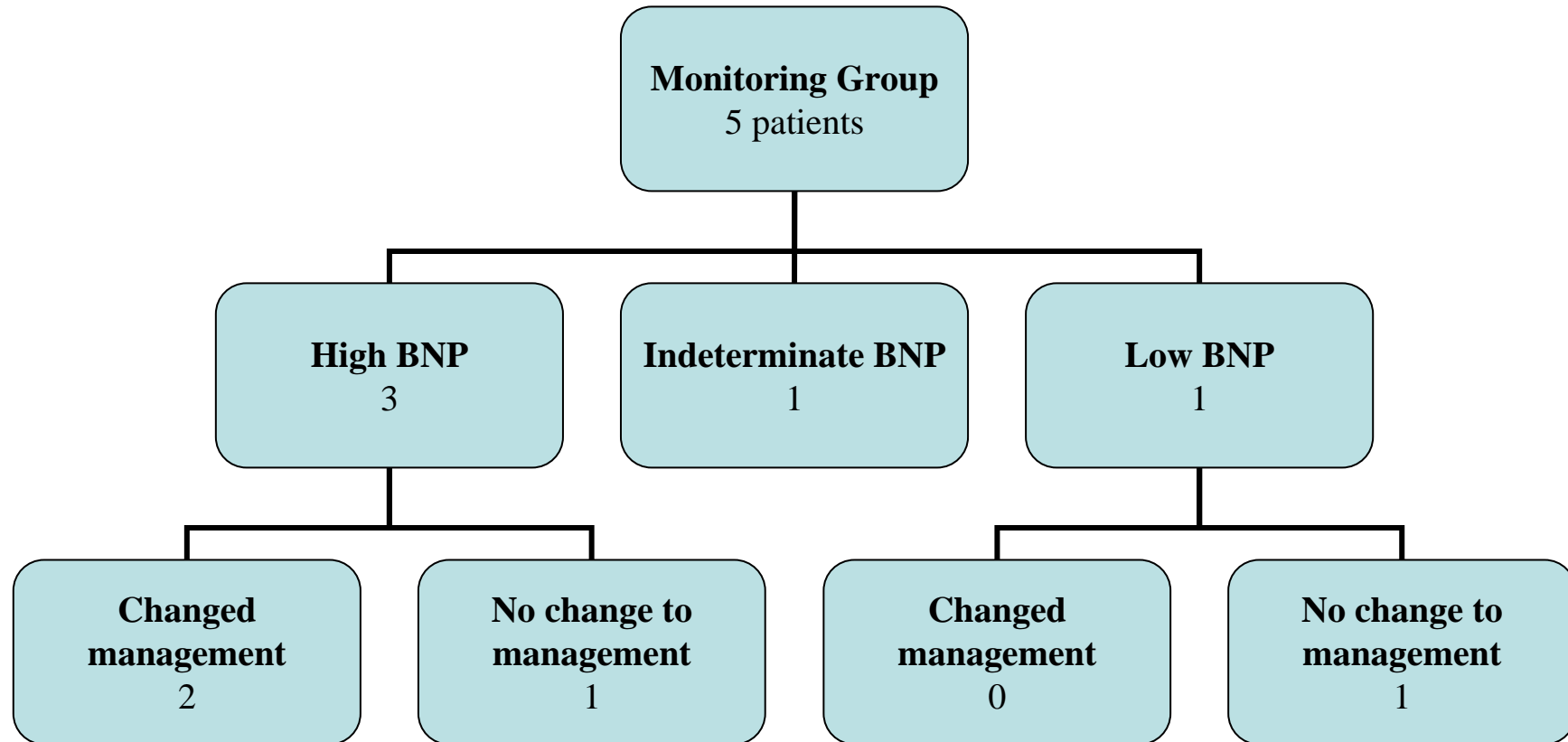
Results for the Diagnostic group



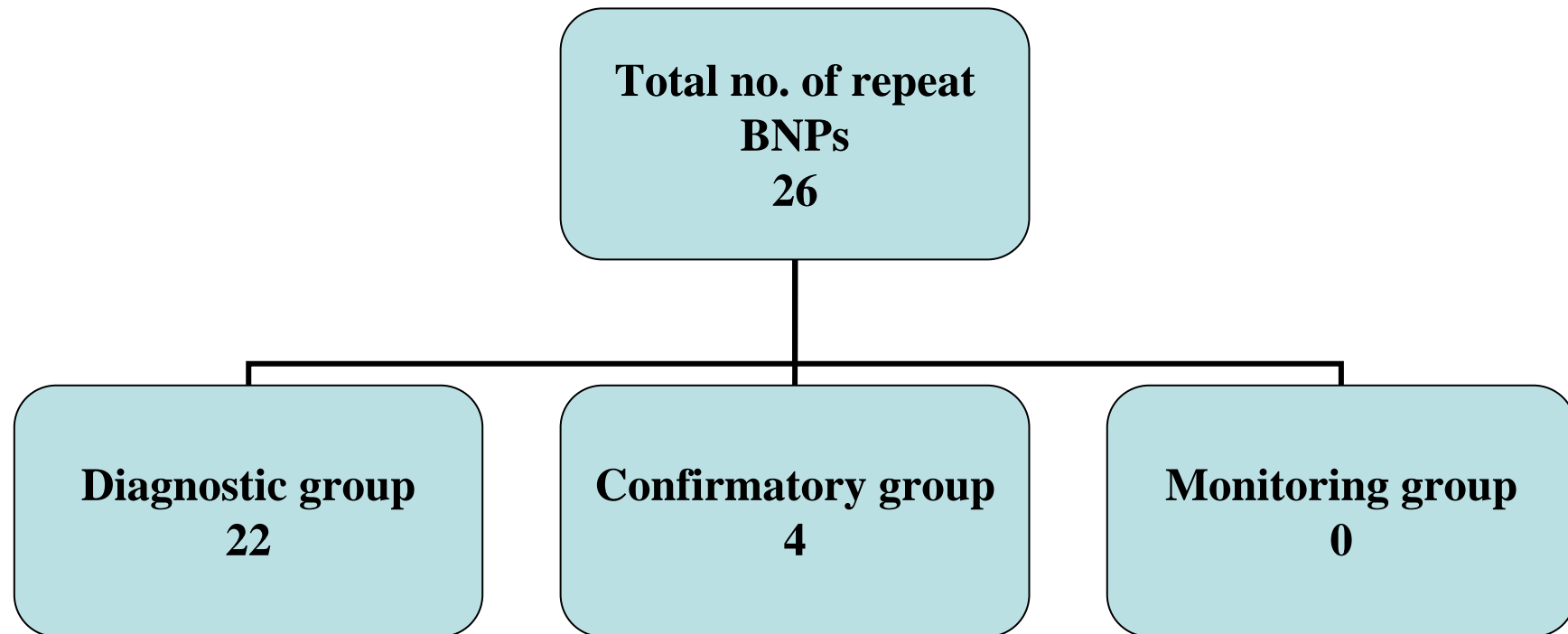
Results for the Confirmatory group



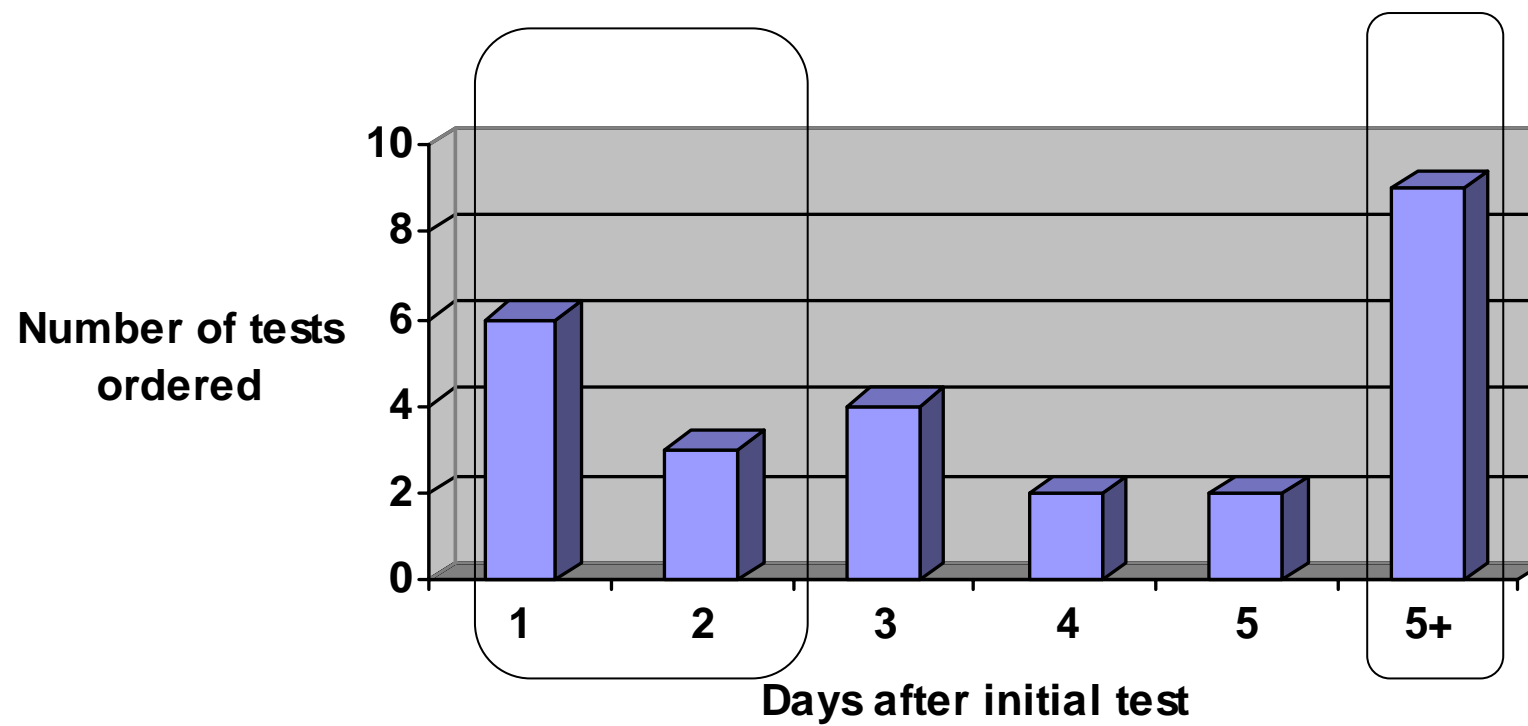
Results for the Monitoring group



Distribution of repeat tests



Spacing of repeats





Discussion

- Across all three groups, the overall yield of a non-equivocal positive or negative was high, being ~70%



Discussion

- The diagnostic and confirmatory groups showed distinctly different patterns:
 - for the diagnostic group, it changed management for 30% overall; and for about 50% of those with an un-equivocal result
 - for the confirmatory group, BNP tended to be positive for the vast majority; but seemed to have little effect upon management



Discussion

- About 1/3 of repeat tests appear to be unintentional



A raised BNP is non-specific

- Female
- Age
- Atrial fibrillation
- Left ventricular dysfunction without decompensation
- Renal failure
- Sepsis
- Stroke
- Right heart strain
 - pulmonary hypertension
 - pulmonary emboli



Thresholds

- Manufacturer's threshold of $<100\text{pg/mL}$
 - -LR 0.13
 - +LR 3.75
- Ours:
 - Low probability $<100\text{pg/mL}$ (-LR 0.13)
 - High probability $>400\text{pg/mL}$ (+LR 11.3)
 - Grey area $100\text{pg/mL} - 400\text{pg/mL}$



Limitations of study

- Generalizability
- Subjectivity



Conclusions

- BNP is a useful test which:
 - has a high unequivocal yield
 - changes management significantly when used in patients with diagnostic uncertainty



Conclusions

- Efficiencies could be gained by:
 - reducing the number of tests ordered on HF patients with little diagnostic uncertainty
 - reducing unnecessary repeats - *limiting the number of BNP tests that can be performed on the same patient within a certain timeframe*



What does this mean?

- Cost per test \$50.00
- Estimated annual cost at Hunter New England Health
 - \$180 000.00
- Cost is growing



Acknowledgements

- John Attia:
 - Professor
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 - Professor
 - John Hunter Hospital

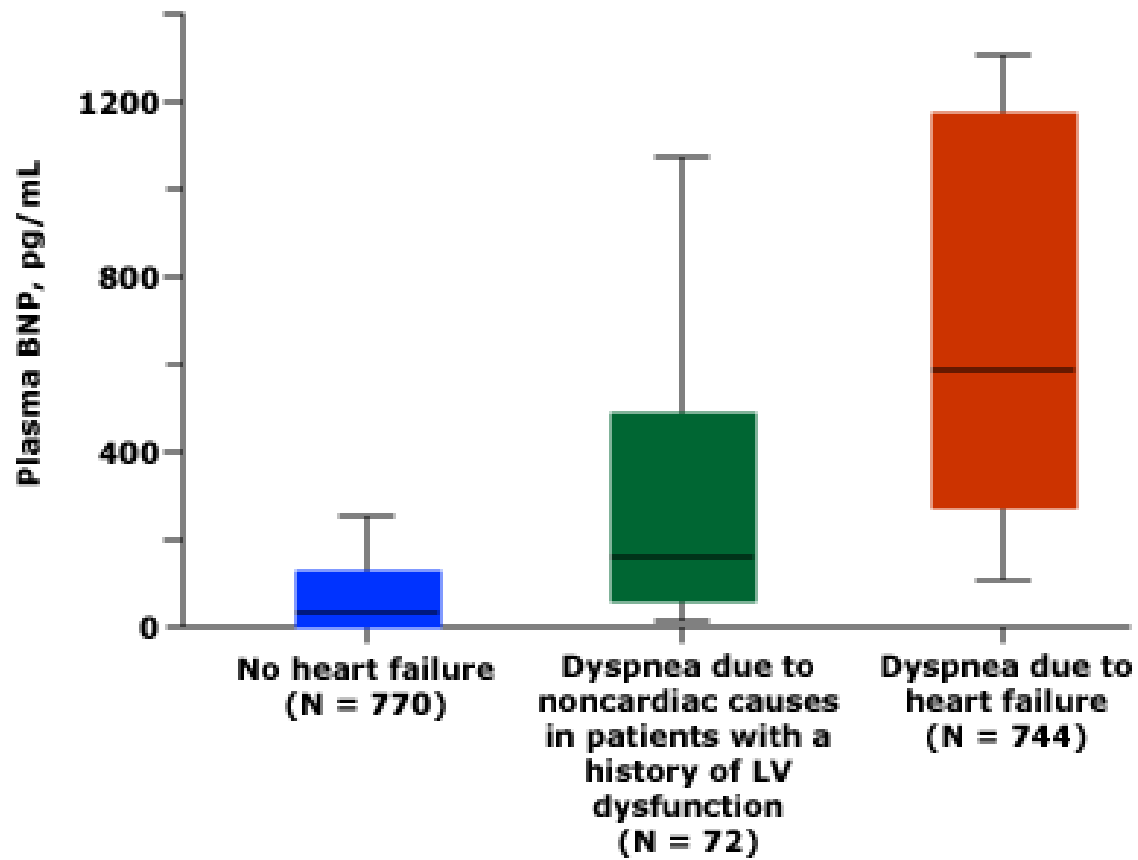
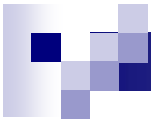


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Questions?







Other uses for BNP

- Primarily used to diagnose or exclude HF:
- Other described indications
 - Monitoring and titration of HF treatment
 - Prognostic marker (chronic HF, stable angina, following AMI)
 - Investigation of pleural effusions