

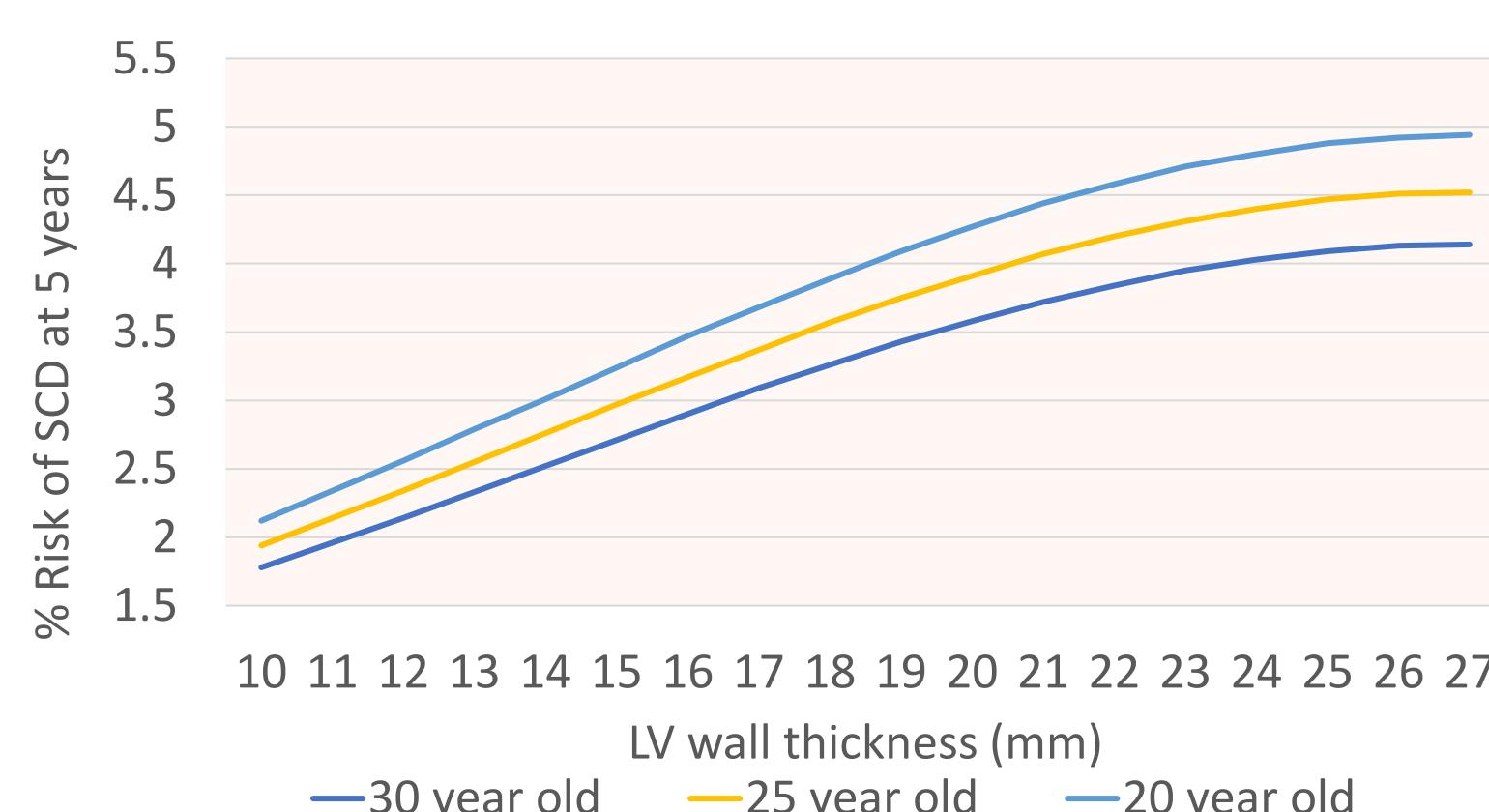
# Repeatability and accuracy of PM measurement of ventricular septal thickness

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## Introduction

- Sudden cardiac death (SCD) describes deaths that occur within an hour of developing symptoms. The majority of these cases are attributable to coronary artery disease (CAD) and cardiomyopathies.
- Hypertrophic cardiomyopathy (HCM) is one such cardiomyopathy and is diagnosed by detecting a left ventricular wall  $\geq 15\text{mm}$ . Any measurement uncertainty may lead to LVH being overlooked and hence important familial causes of SCD not investigated.
- 5 year SCD risk is subject to greater change over the range of LV wall thicknesses where hypertrophy is less pronounced (Figure 1).

Figure 1- 5 Year SCD Risk vs LV Wall Thickness



- Echo is the usual way of assessing LVH. Investigating the difference between echo and autopsy LV measurements will help improve post-mortem (PM) diagnosis of LVH and therefore diseases such as HCM.

## Aims

- Investigate the difference between echo and autopsy LV wall thickness
- Determine the accuracy and reproducibility of echo and autopsy measurements

## Methods

1

- We measured the hearts of 24 patients who had died within 6 months of having an echo.
- Measurements were recorded in the parasternal long axis plane (PLAX-Figure 2) at the level of the mitral valve leaflet tips, in accordance with BSE guidelines.
- We made equivalent measurements on a parasternal short axis cross section of heart tissue (Figure 3), taking care to exclude trabeculations and papillary muscles.
- A 2mm difference between wall thickness on echo and PM was considered clinically significant.

Figure 2-PLAX Echo of LV

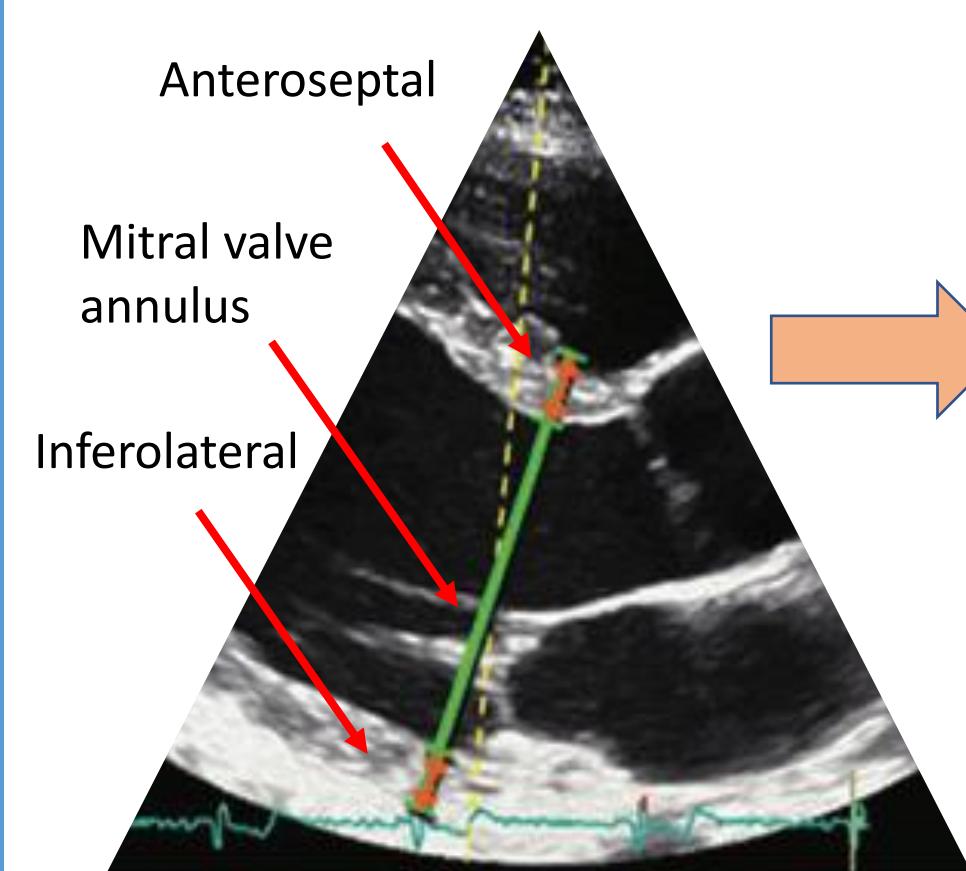
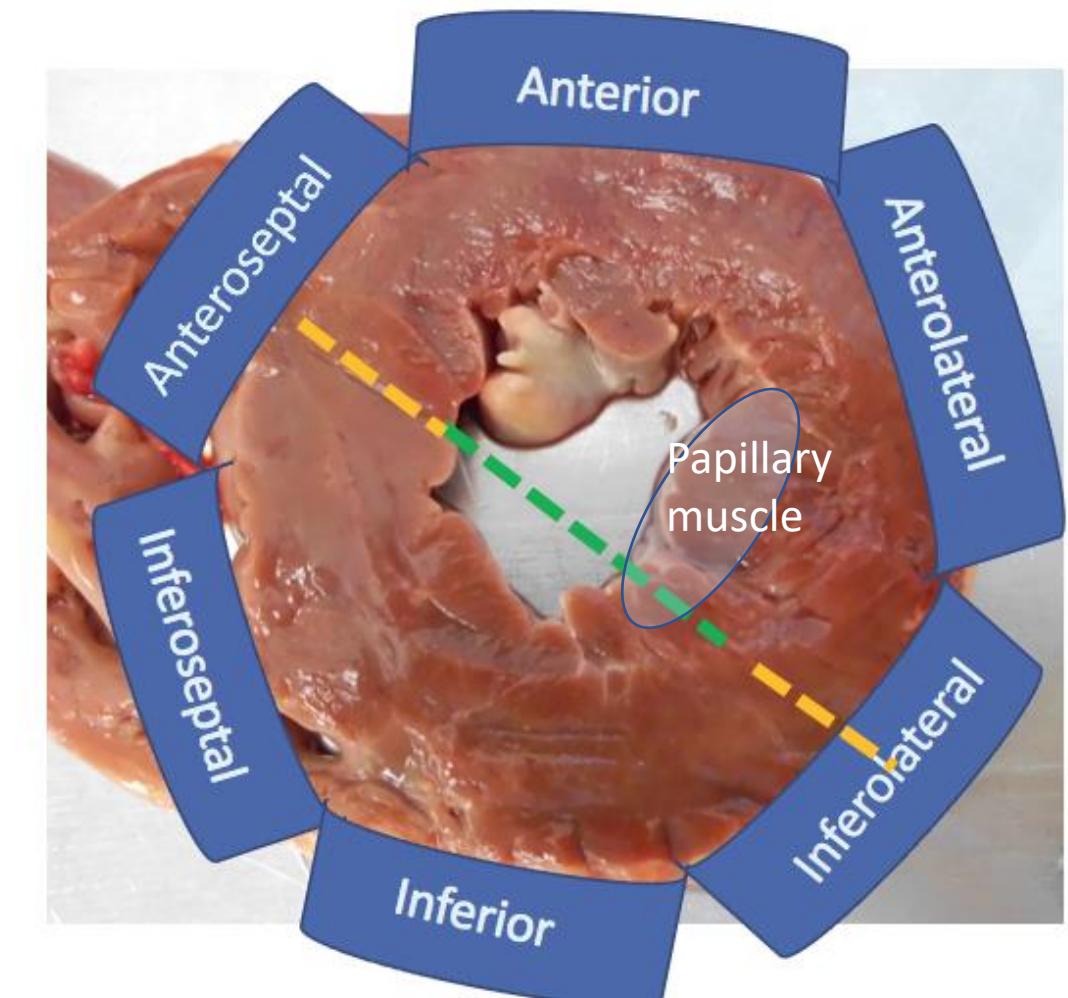


Figure 3- Cross section of LV at mitral valve leaflets



2

To validate our findings, we performed a reliability study of both echo and autopsy measurements:

- 10 Echo images, of which 3 were identical, were measured by 11 BSE trained members of the Freeman Hospital echo department.
- 3 hearts were measured 3 times by 3 investigators using the method outlined in Figure 3.

## Results

2

### Posterior wall measurements are more variable than septum measurements

- Septum measurements produced similar results for echo and PM, with both displaying good repeatability between investigators (inter) and for the same investigator carrying out multiple measurements (intra).
- With the exception of the echo intrarater result, septum measurements were consistently more repeatable than posterior wall ones.

Interrater intraclass correlation coefficient (95% CI)

Intrarater intraclass correlation coefficient (95% CI)

Table 1- Summary of repeatability of echo and post-mortem measurements

Echo	Septum	Posterior wall	Post-mortem	Septum	Posterior wall
	0.84 (0.66, 0.96)	0.63 (0.38, 0.88)		0.89 (0.42, 1.0)	0.52 (-0.35-0.98)
	0.78 (0.51, 0.93)	0.85(0.64,0.95)		0.79(0.50, 0.94)	0.67(0.29, 0.90)

#### Key:

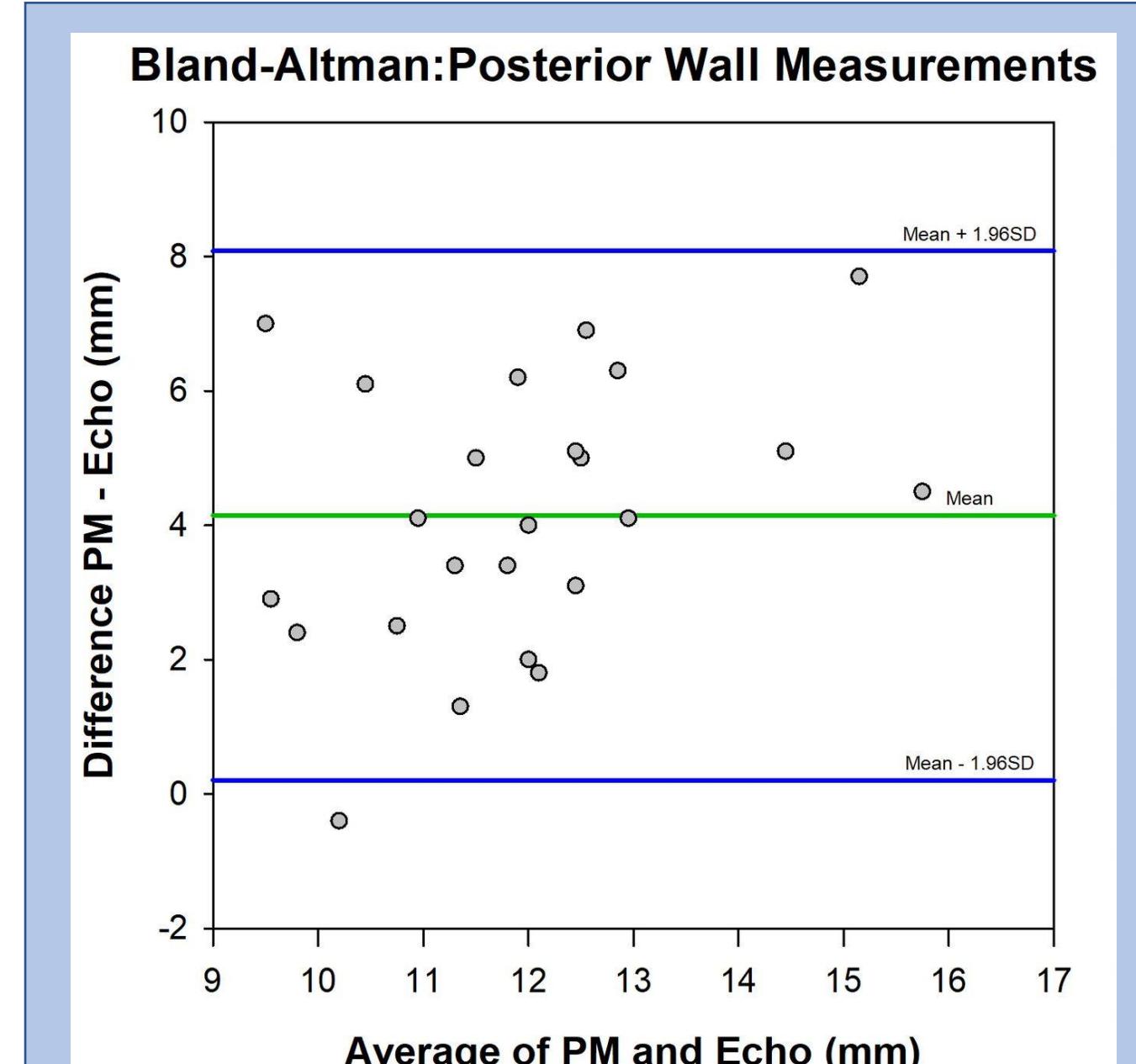
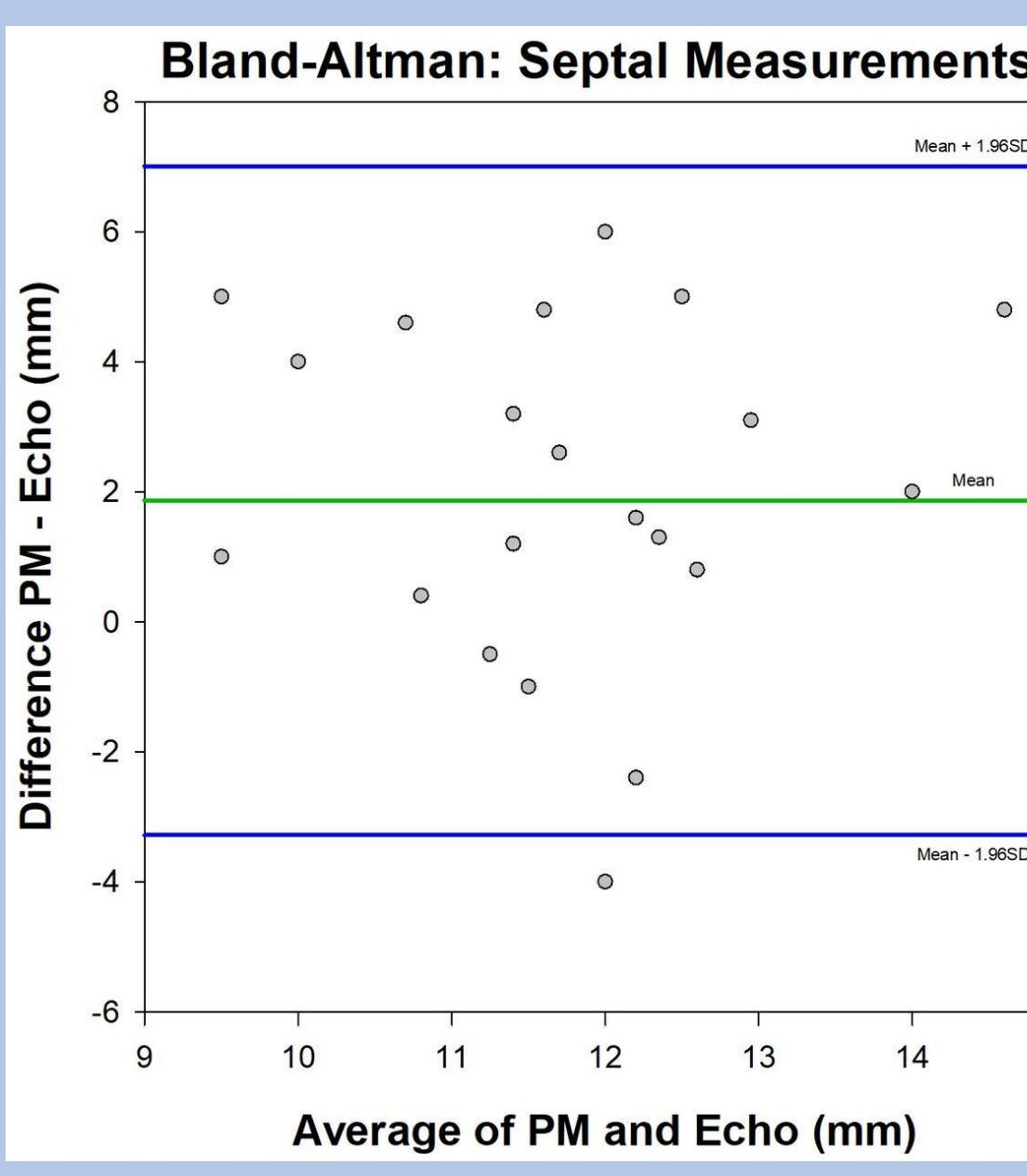
Limits of agreement (Mean +/- 1.96 SD) = \_\_\_\_\_

1

Mean Difference = \_\_\_\_\_

### PM and echo posterior wall measurements differ by approximately twice that of septum measurements

- PM measurements of the septum were larger than echo measurements by an average of 1.87mm ( $p=0.003$ ).
- 83% of PM measurements were overestimates of their echo counterparts.
- Measurements correlated very poorly,  $r=-0.067$  ( $p=0.78$ ).
- Limits of agreement were wide (-3.28 and 7.01). A negative lower limit means PM will underestimate echo in some cases.
- Posterior wall measurements had a mean difference of 4.15 mm ( $p=0.000$ ).
- 96% of values were larger at PM than at echo.
- There was a significant correlation between posterior wall measurements 0.46 ( $p=0.023$ ).
- Limits of agreement, 0.21 and 8.08, were narrower for posterior wall differences.



## Conclusions

- Septum and posterior wall measurements are consistently larger at autopsy,
- Posterior wall measurements are less repeatable.

We intend to use PMCT...preliminary analysis of repeatability suggests contrast scans could be a better way of assessing post mortem LVH in the future.

## Future Work

- Preliminary analysis of PMCT repeatability data suggests contrast scans could be a better way of assessing post mortem LVH in the future. We are recruiting more patients for a further study.