Improving Echocardiogram Report Completeness in Patients with Repaired Tetralogy of Fallot: A Quality Improvement Initiative

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Background

- Multimodality imaging guidelines have been developed for patients with repaired tetralogy of Fallot (TOF) that identify 17 key reporting elements for echocardiograms (Valente AM et al, JASE 2014)
- Adherence to such guidelines has been poor across multiple institutions, especially quantitative assessment of right ventricular (RV) function (Annavajjhala V et al, IJC 2019)
- We report a quality improvement effort to increase guideline adherence at our institution for patients with repaired TOF, with a focus on improving quantitative assessment of RV function.

Methods

- Baseline compliance established with retrospective review of echocardiogram reports in patients with repaired TOF for 17 recommended reporting elements over a 3 month period. (Table 1)
- Intervention 1:
  - Presentation of baseline data to the echocardiogram lab
  - Review of TOF-specific guidelines
- Intervention 2:
  - Routine TAPSE measurement recommended for all echocardiograms
- Reporting rates for all 17 elements evaluated following intervention 1
- Reporting rates for RV function by TAPSE evaluated following intervention 2, subdivided into sonographer TAPSE image collection and attending reporting of TAPSE

Results

- At baseline, adherence was poor
  - No complete studies
  - Median 65% of elements reported
  - Measurements reported less frequently than descriptive elements (median 40% vs 78%, p<.0001). (Table 2)
- Post intervention 1:
  - Improved element reporting (median 71% vs 65%, p=0.02), mostly due to increase in measurements (median 50% vs 40%, p=0.02) (Figure 1)
  - Reports of RV function did not significantly change, but sonographer compliance improved (33% vs 14%, p=0.03)
- Post intervention 2
  - Total RV function assessment continued to improve when including sonographer images (50% vs 14%, p=0.001). (Figure 2)

Table 2. Percentage of Elements Completed Across Cohorts

	Retrospective (N=78 studies)	Prospective 1 (N=27 studies)	P-value[*]	Prospective 2 (N=19 studies)	P-value[†]
Percent Completion of all 17 elements	64.7 (58.8-70.6)	70.6 (60.0-82.4)	0.02	---	---
Percent Completion by category					
Descriptive (9 elements)	77.8 (66.7-77.8)	77.8 (71.4-88.9)	0.20	---	---
Measurement (6 elements)	40.0 (33.3-50.0)	50.0 (33.3-66.7)	0.02	---	---
Number of studies including RV size	27 (34.6)	14 (51.9)	0.08	6 (31.6)	0.80
Number of studies including RV function	11 (14.1)	3 (11.1)	1.00	5 (26.3)	0.30
Total RV function (reported and TAPSE images)	N/A	9 (33.3)	0.03	10 (50.0)	0.001

[*] Data are presented as N (%) for categorical variables and Median (interquartile range) for continuous variables.

[*]Comparison between retrospective cohort and first prospective cohort.

[†]Comparison between retrospective cohort and second prospective cohort.

Table 1. Echocardiogram reporting elements

RVOT/MPA (dimension measured)

RVOT/MPA (location/mechanism of obstruction described)

RVOT/MPA (presence of aneurysm)

RVOT or RV-PA conduit (peak/mean gradient by 2D, color, and spectral Doppler)

Degree of PR (described)

Branch PAs (dimensions of narrowest and/or maximal segments)

Branch PAs (location and severity of obstruction by 2D, color, and spectral Doppler)

TR (degree and mechanism)

Vena contracta width (measured if more than mild TR)

RV pressure (measured via any of: TR jet velocity, if TR envelope is insufficient; trans-VSD gradient; systolic septal configuration)

RV size (quantified via diameter of RV, indexed end-diastolic cross-sectional area, TV annular diameter, or diastolic septal flattening)

RV function (measured with any of: EF, FAC, Dp/Dt, Tei index, TAPSE, 3D EF, TDI Ś)

Residual VSDs (described)

Residual ASDs (described)

Aortic dimensions (measured)

Aortic regurgitation (described)

Systemic-to-pulmonary collaterals from color Doppler interrogation and spectral Doppler evaluation of abdominal aorta for diastolic runoff

LV size and function (quantified with some measurement of EF)

Figure 2. Quantification of RV function using TAPSE at baseline, post intervention 1, and post intervention 2. Inclusion in reports is denoted in blue; studies with recording of TAPSE images but not reported are in maize.
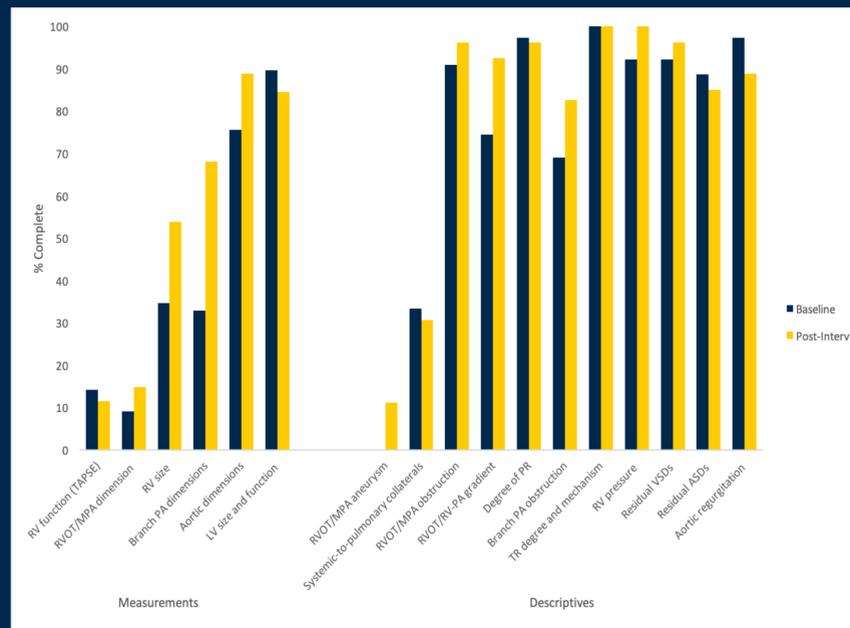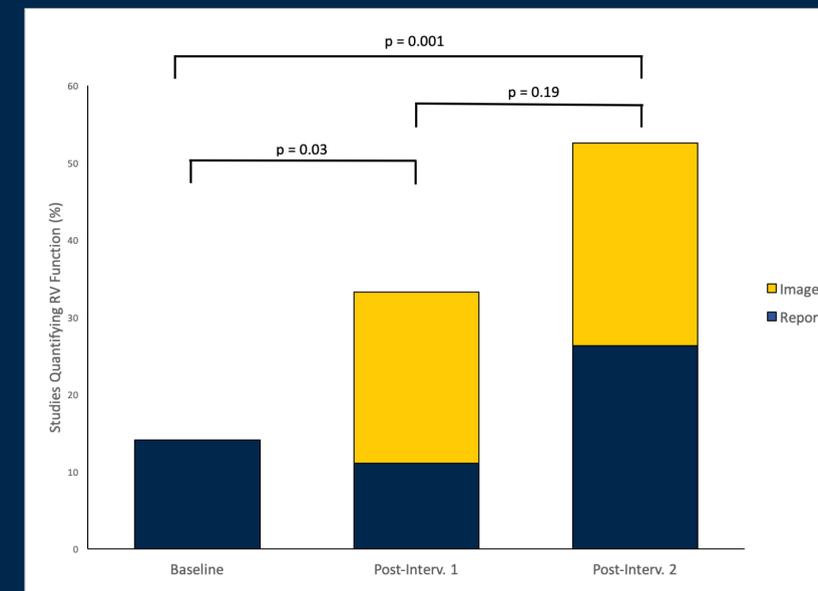

Figure 1: Comparison of reporting rates of all elements to baseline following intervention 1. Baseline percentages are denoted in blue; post intervention 1 percentages are in maize.

Conclusions

- Our institution had similar rates of repaired TOF guideline adherence at baseline compared to institutions identified in a prior study
- Given low adherence across institutions, there is a need to identify strategies for increasing adoption of published guidelines
- Reviewing lesion-specific guidelines and standardizing TAPSE measurements improved guideline adherence
- RV function assessment improved predominantly among sonographers rather than attendings.
- Protocol-specific reporting templates may find slower acceptance by attendings than by sonographers, and further interventions may be required to change attending practice patterns.