Re-operations in Repaired AVSD

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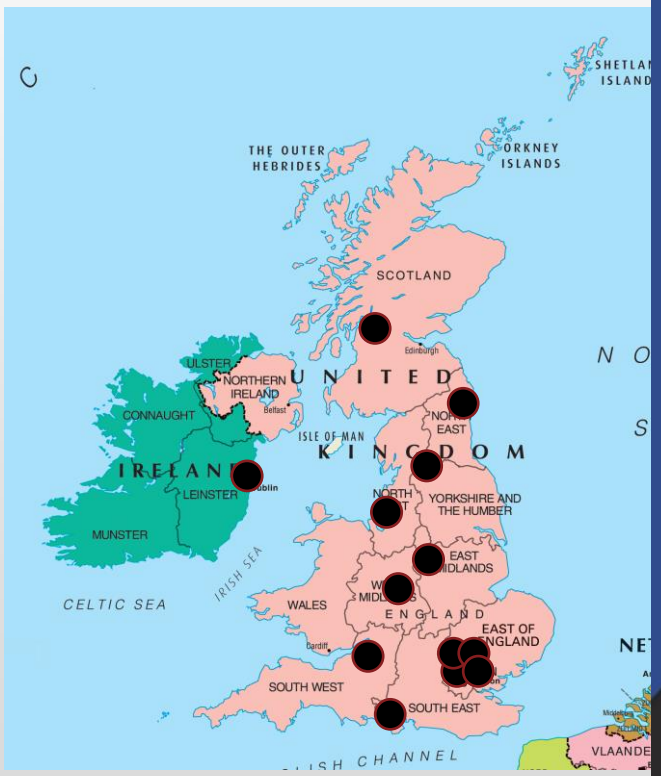
Mater Hospital Dublin

Re-operations in Repaired AVSD

- Data capture in UK and Irish system – NICOR
- What kind of reoperations are needed in childhood?
- What kind of reoperations are needed in adulthood?
- Experience from the Irish population
- Experience from the literature
- Case example from reoperation in childhood
- Case example from reoperation in adulthood

Data capture in the UK and Irish System:
NICOR
National Institute for Cardiovascular Outcomes Research



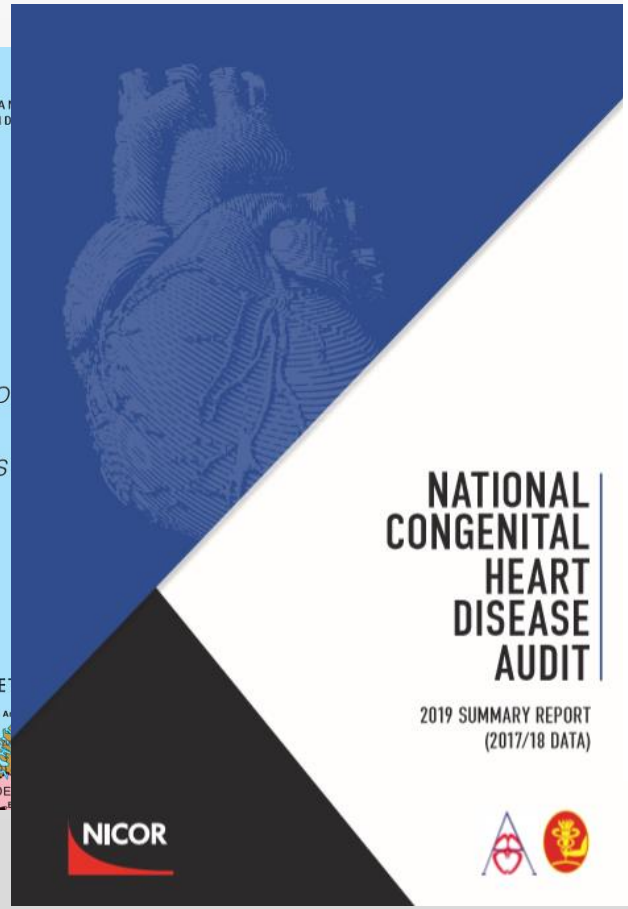
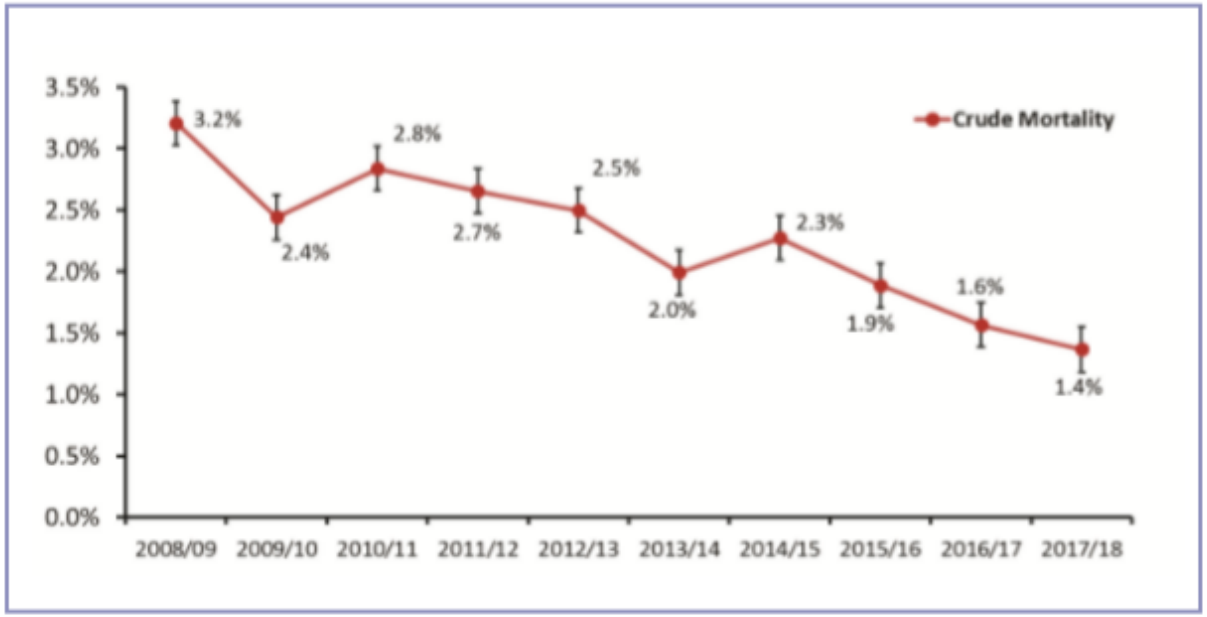


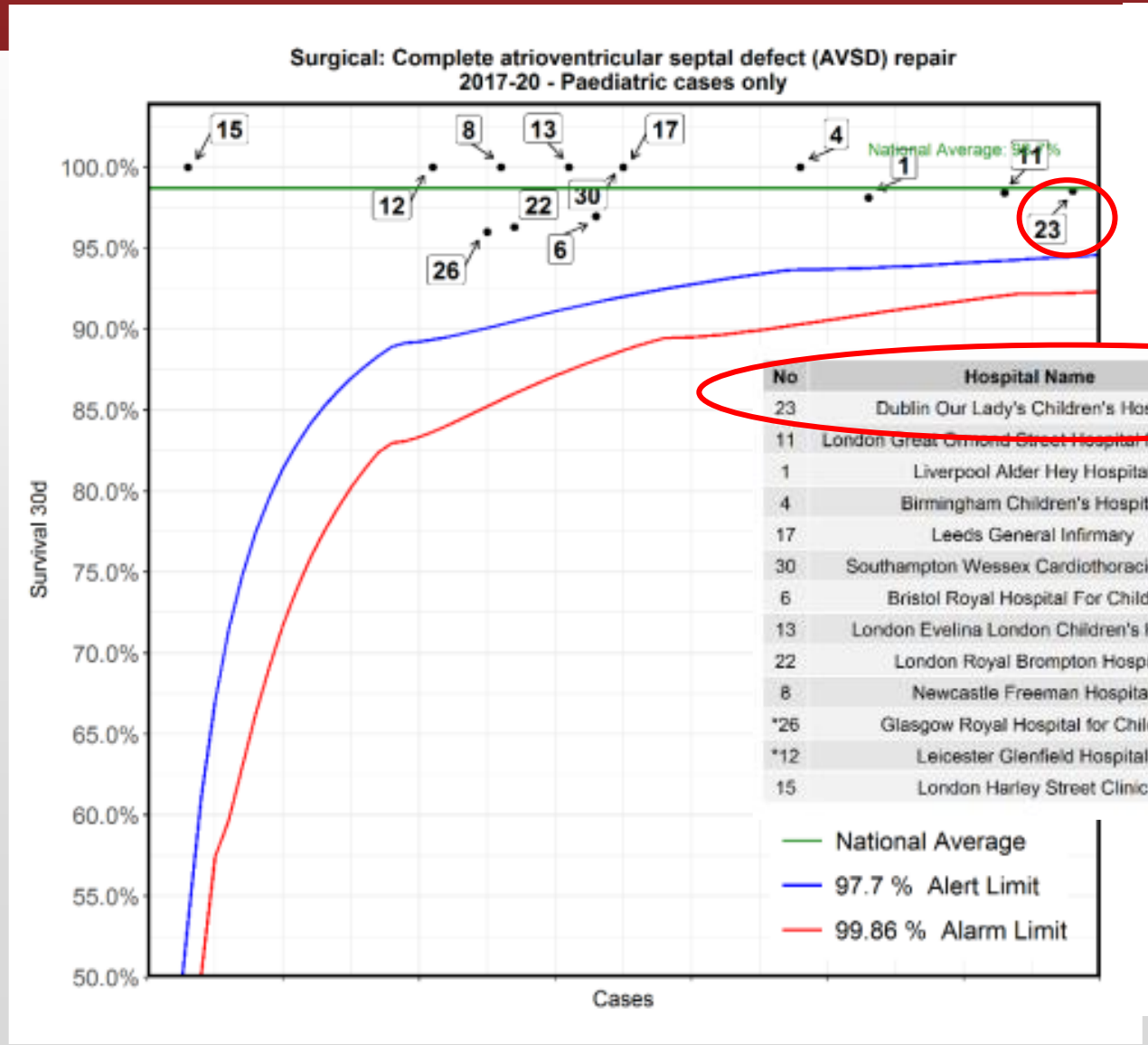
Figure 2: *Trends in 30 days unadjusted mortality after surgery over 10 years (2008/09-2017/18 financial years) in children (under 16 years)*



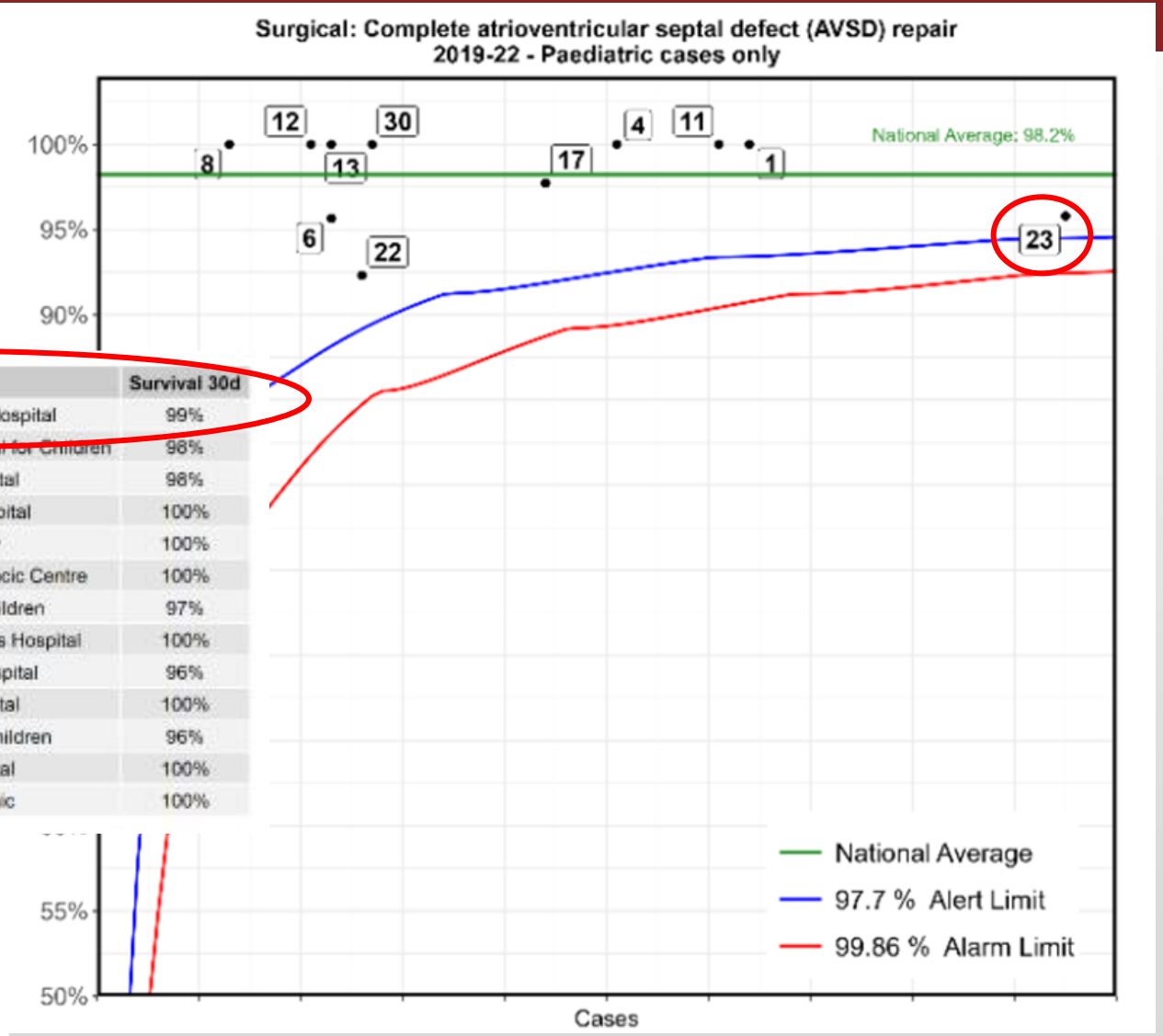
>5000 Cardiac Surgery's per year
>5000 Caths per year

www.nicor

Data Capture in the UK and Irish System – NICOR
Procedure specific data – Complete AVSD



No	Hospital Name	Survival 30d
23	Dublin Our Lady's Children's Hospital	99%
11	London Great Ormond Street Hospital for Children	98%
1	Liverpool Alder Hey Hospital	98%
4	Birmingham Children's Hospital	100%
17	Leeds General Infirmary	100%
30	Southampton Wessex Cardiothoracic Centre	100%
6	Bristol Royal Hospital For Children	97%
13	London Evelina London Children's Hospital	100%
22	London Royal Brompton Hospital	96%
8	Newcastle Freeman Hospital	100%
*26	Glasgow Royal Hospital for Children	96%
*12	Leicester Glenfield Hospital	100%
15	London Harley Street Clinic	100%



Irish Congenital Cardiac System

Republic of Ireland (Green) – Population 5.5 Million

(Last 3 years now includes Northern Ireland (Pink) – 1.5 million)

Children's Health Ireland

Misericordia

Mater Hospital Dublin

Experience from the Litterature:
Sweden – Lund Group – Semin Thorac Surg 2022 35:530

1993-2020 : 27 years
477 patients with biventricular repair for AVSD

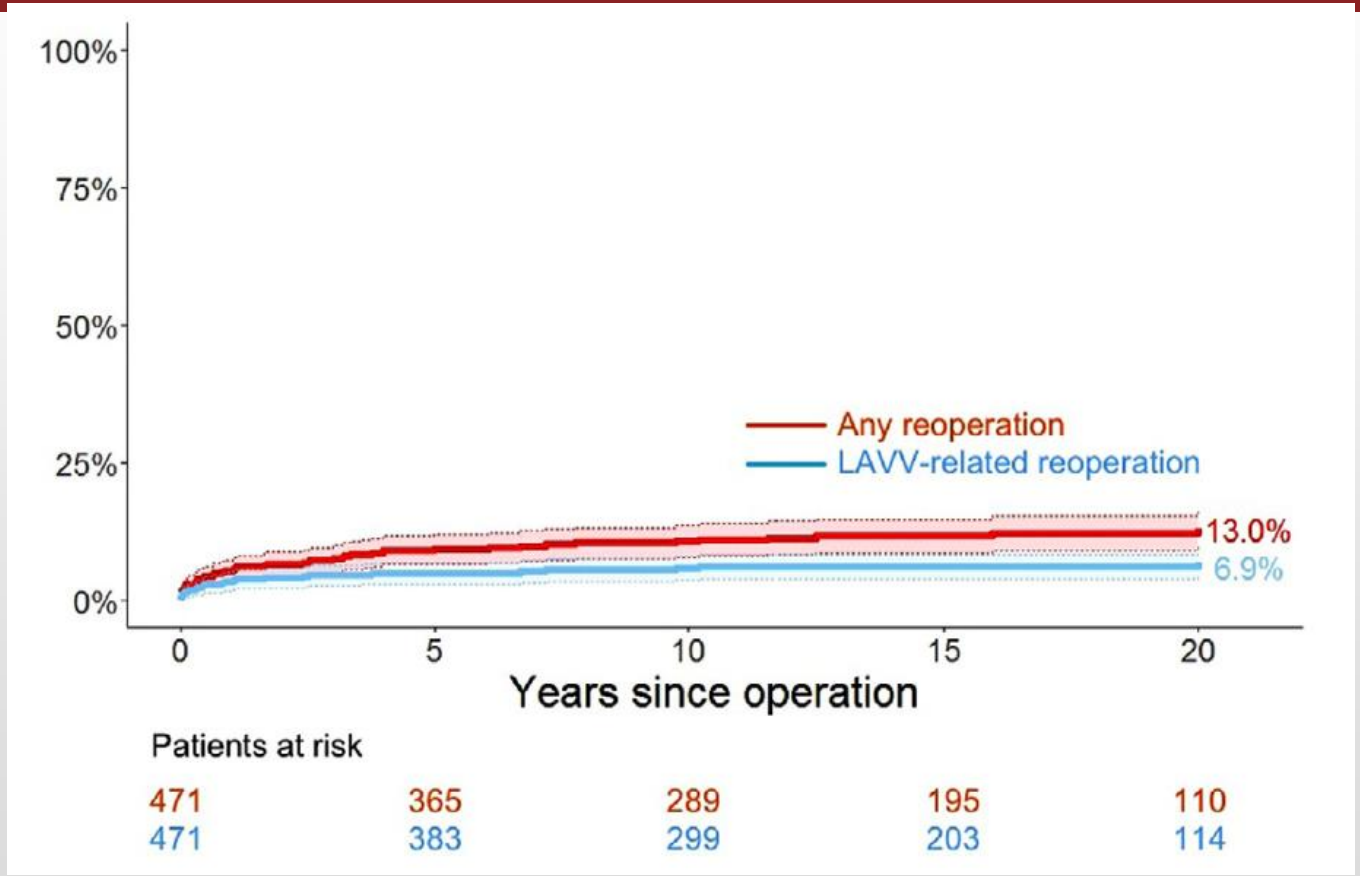
13% reoperation rate at 20 years

53 patients needed 82 procedures

Indications for reoperation:
35% Left AV valve procedure(Cleft closure, dysplastic leaflet repair, 89% repairs)
33% LVOT procedure (Subaortic resection)
9% Residual shunt procedure

Median time to reoperation 1.1 years

Perioperative Mortality for redo 3.8%



2nd reoperations required for:
valve regurgitation(23%) and recurrent LVOTO (25%)

Experience from the litterature:
Netherlands – Leiden Group – Annals Thorac Surg 2012 93:849

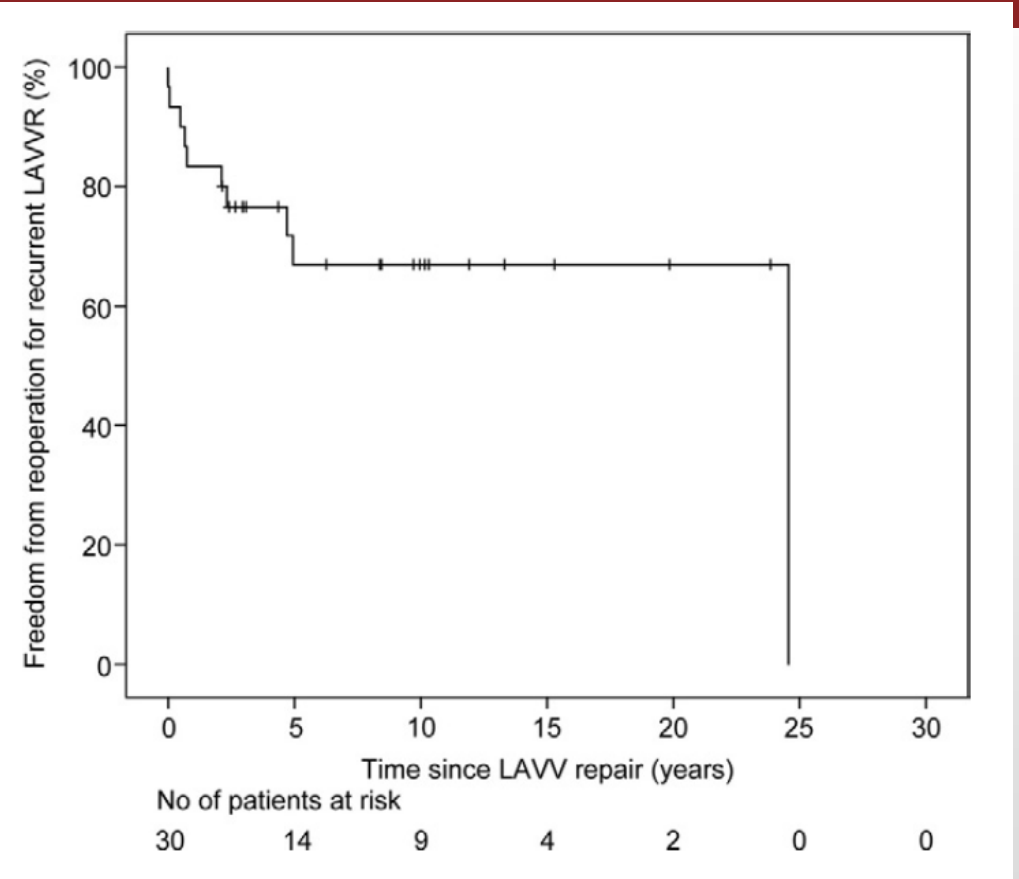
1976-2006: 30 years
312 patients with biventricular repair for AVSD

21% reoperation rate at 15 years

Indications for Reoperation:
Only looked at reoperations for left AV valve
(69% repairs – cleft closure, annuloplasty)

Median time to reoperation 1.4 years

Perioperative mortality for redo 6.7%



2nd Reoperations required for:
Valve regurgitation (32%) – 60% replacements

Experience from the Litterature:
Austrailia – Complete AVSD study Group – EJCTS 2022 61:45

1990-2015: 4 centres, 25 years
829 patients with biventricular repair of complete AVSD

13% reoperation rate at 10 years

Indications for Reoperation:
Left AV valve surgery 69% (87% repairs)
Subaortic obstruction 19%
Residual shunt 11%

Reoperation within 30 days of index surgery 6.8% of initial repair cohort.

Perioperative mortality for Redo 3.3%

2nd Reoperations required for:
Left AV valve issues (21%),
Recurrent subaortic obstruction (52%)

Experience from the Litterature:
USA – STS Database – JTCVS 2014 148(6):2526

STS Database only records 30 day outcomes
No longterm follow-up available

2008-2011: 3 years
2399 patients with biventricular repair of complete AVSD
101 centres

3% Reoperation rate during same in-patient stay

	Frequency, n (%)	In-hospital mortality	Reoperations with cardiopulmonary bypass before discharge (%)
Weight at surgery			
<3.5 kg	151 (6.3)	15.2	4.0
≥3.5 kg	2247 (93.7)	2.2	3.0
P value	—	<.0001	.49
Age at surgery			
≤2.5 mo	284 (11.8)	9.5	7.0
>2.5 mo	2115 (88.2)	2.1	2.5
P value	—	<.0001	<.0001
Down syndrome			
No	517 (21.6)	4.4	5.4
Yes	1882 (78.4)	2.6	2.4
P value	—	.03	<.001
Overall	2399 (100)	3.0	3.0

Experience from the litterature
USA – Mayo Clinic – Ann Thorac Surg 2009 87:1872

1972-2007: 35 years

Patients with previous complete AVSD repair

50 patients had 61 reoperations

Median time to reoperation 15 months

Indications for surgery:

Left AV valve regurgitation 82%(50% replacements)

Subaortic stenosis 10%

ASD/PA stenosis

Table 3. Valve Repair Techniques Utilized at First Reoperation

Technique[a]	Number
Cleft repair	14
Primary	8
Re-repair	6
Annuloplasty	14
Eccentric	6
Pursestring	4
Ring	4
Leaflet reattachment to patch	7
Alfieri stitch	1
Papillary muscle splitting	1
Commissurotomy	1
Leaflet perforation repair	1

Reoperation mortality 4%

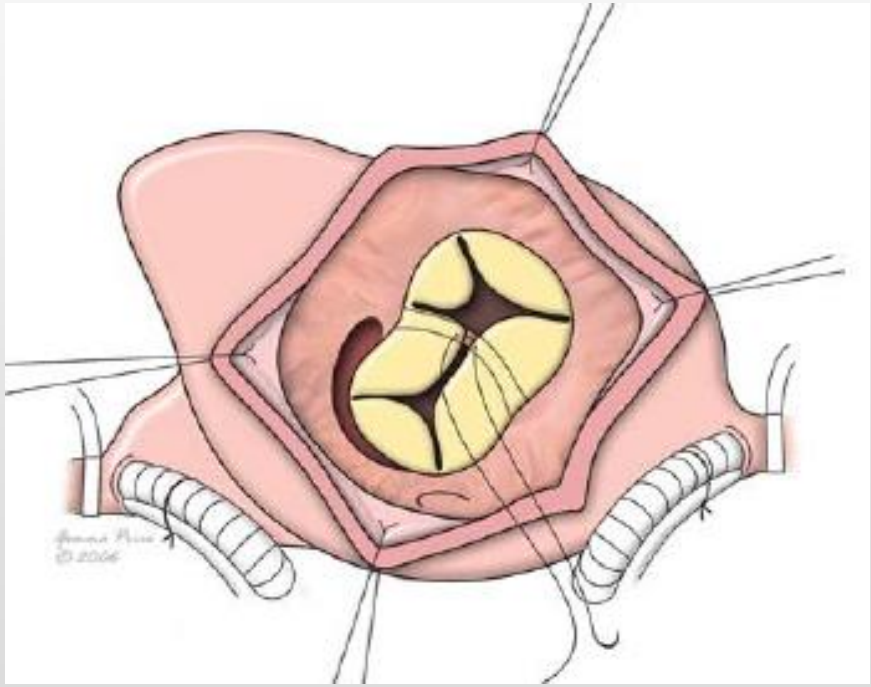
Case example from reoperation in childhood

4 month old male, 4.5 Kg, Large complete AVSD, Non-T21

- BD Frusemide and spironolactone, High calorie NG feed at home
- Moderate left AV valve regurgitation pre-op
- 2 patch repair of complete AVSD with note intraop of dysplastic deficient inferior bridging leaflet.
- Left sided cleft closed with interrupted sutures and De-Vega suture annuloplasty at the mural leaflet.

- Discharged Day 8 post-op with Mild left AV valve regurgitation.

- Presented 4 weeks post discharge to local hospital with rapid deterioration over 12 hours with shock type picture.
- Intubated, lactate 6, transferred to cardiac surgery centre.



Case example from reoperation in childhood

- ECHO showed severe left AV valve regurgitation through cleft in anterior leaflet
- Almost systemic pulmonary artery pressures
- Severe pulmonary oedema
- Stabilisation with inotropes and diuresis

Reoperation:

Noted cleft sutures completely torn through superior bridging leaflet

Attempted partial reclosure and patch interposition but very fragile leaflet tissue and major concern that the repair would not hold.

What kind of valve replacement in a 5 month old, 5 Kg child?

Mechanical Mitral valve replacement(15/17mm)

Outcomes of Mechanical Mitral Valve Replacement in Children

Chizitam Ibezim,* Amber Leila Sarvestani, BA,* Jessica H. Knight, PhD, Omar Qayum, MD, Noor Alshami, Elizabeth Turk, BS, James St. Louis, MD, Courtney McCracken, PhD, James H. Moller, MD, Lazaros Kochilas, MD, and

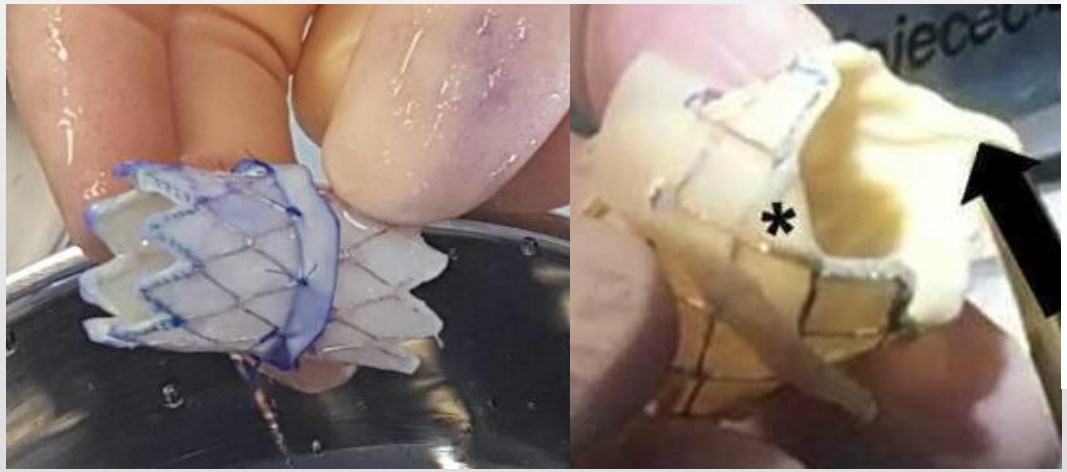
Over 50% of those having a mechanical valve replacement under 2 years old
will die before they are 20 years old

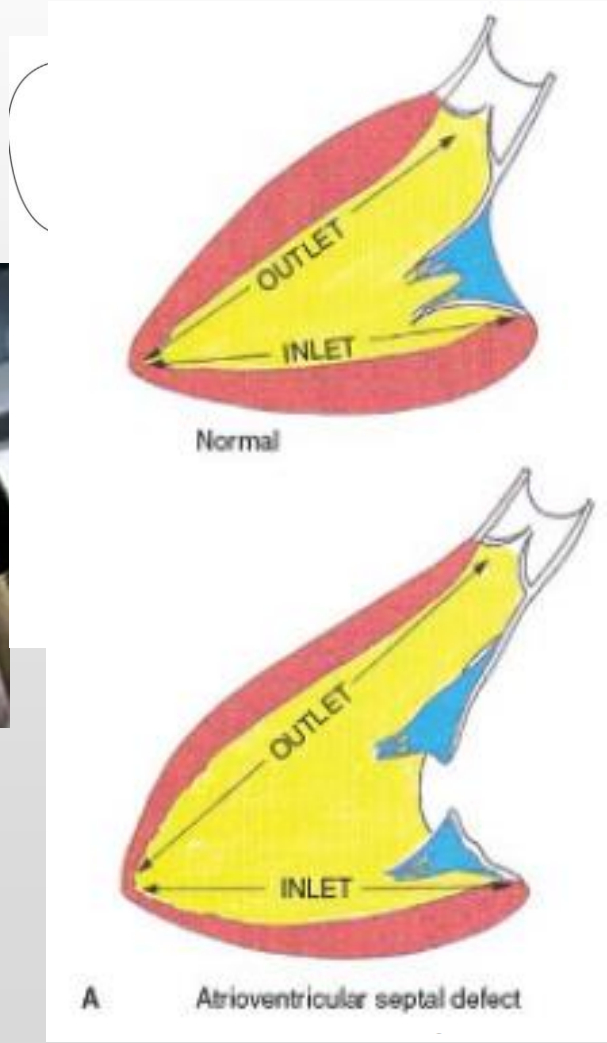
Warfarin use in a young child

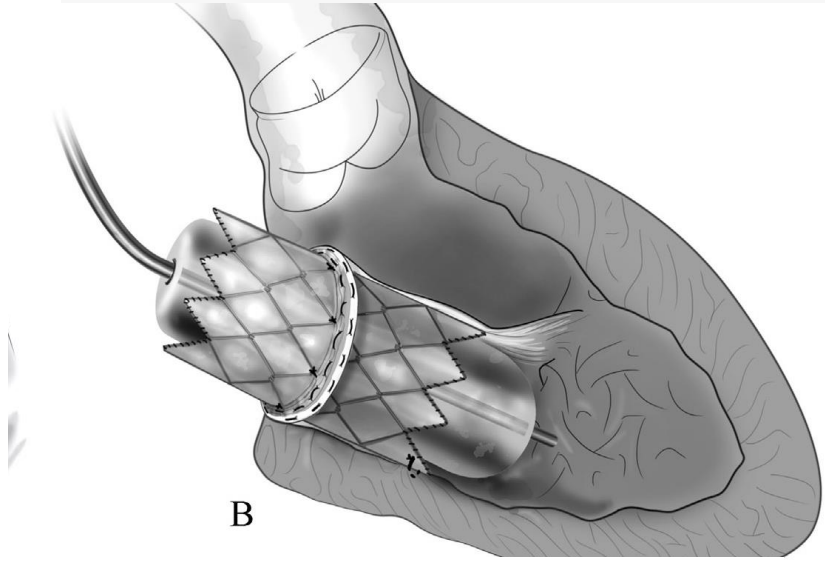
(Ann Thorac Surg 2019;107:143–50)

Case example from reoperation in childhood

Mitral Melody valve replacement (14mm)







l Valve Replacement ☆

parable mitral valve disease, mitral valve replacement is
ent in a child with small annulus is off label use of the
. The device modifications and implantation technique
vers to prevent perivalvular leak and left ventricular
results are acceptable, but long term performance of
nown.

and Cardiovasculary Surgery 19:454-463 © 2014

Case example from reoperation in childhood

Underwent Mitral Melody valve replacement (14mm) with 4mm fenestration left in the atrial septal patch for percutaneous access later.

-Extubated after 1 week, initially on Therapeutic Tinzaparin, ECHO showed no stenosis or regurgitation and no LVOTO

Week 2 post-op, echo showed a new moderate paravalvar leak in the LVOT area

-Advice from Ram Emani (Boston) - had seen this issue also and now were using an additional concentric suture in the left atrium to gather it around the Melody valve.

-Taken back to theatre:

Noted superior bridging leaflet had torn at LVOT area where melody valve pericardium annulus was sutured. Placed the concentric ring suture and re-inforced the atrial side of valve anchoring with an additional ring of pericardium sutured to the left atrium and melody valve nitinol cage.

-Discharged after 3 weeks, only on aspirin.

5 years old
– moderate to severe mitral melody stenosis and moderate regurgitation

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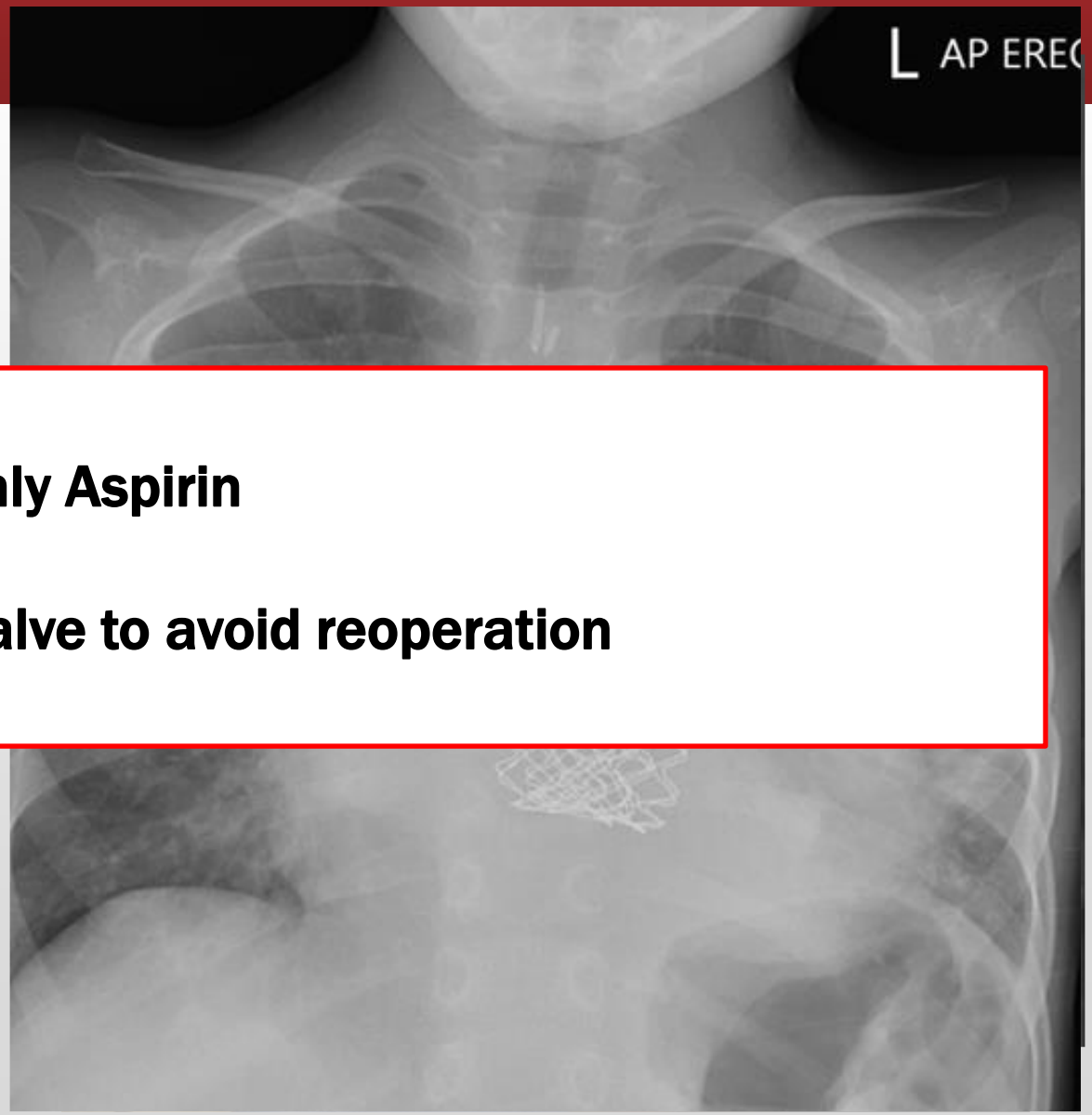
Volume 11, Issue 11, November 2018
https://doi.org/10.1161/CIRCINTERVENTIONS.118.007145

American Heart Association.

CONGENITAL HEART DISEASE

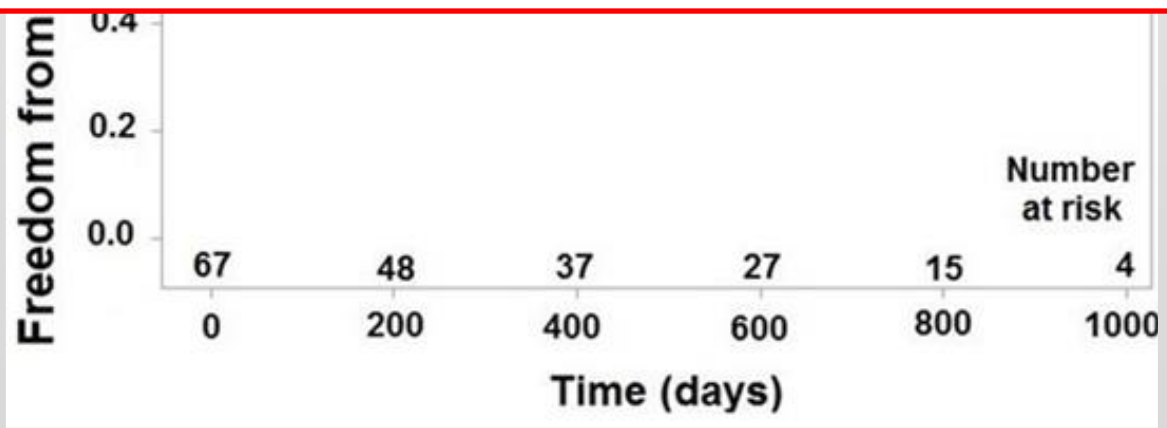
Surgical Atrioventricular Valve Replacement With Melody Valve in Infants and Children

A Multicenter Study



No Warfarin, only Aspirin

Can be redilated or Valve in Valve to avoid reoperation



Experience from the litterature
USA – Mayo Clinic – Ann Thorac Surg 2010 89:1352

1962-2006: 44 years

Previous Partial AVSD repairs

96 patients needed reoperations

Median age 26 years old

Median time to reoperation 10 years

Indications for surgery:

Left AV valve regurgitation 67% (50% replacements)

Right AV valve regurgitation 22%

ASD 11%

Table 2. Valve Repair Techniques Utilized At First Reoperation

Technique[a]	No.	%
ZOA repair	31	32
Rerepair	19	20
Primary	12	12
Annuloplasty	24	25
Eccentric	14	15
Pursestring	5	5
Ring	5	5
Edge to edge repair	5	5
Leaflet perforation repair	4	4
Papillary muscle splitting	1	1
Accessory orifice closure	1	1

Reoperation mortality 5.2%

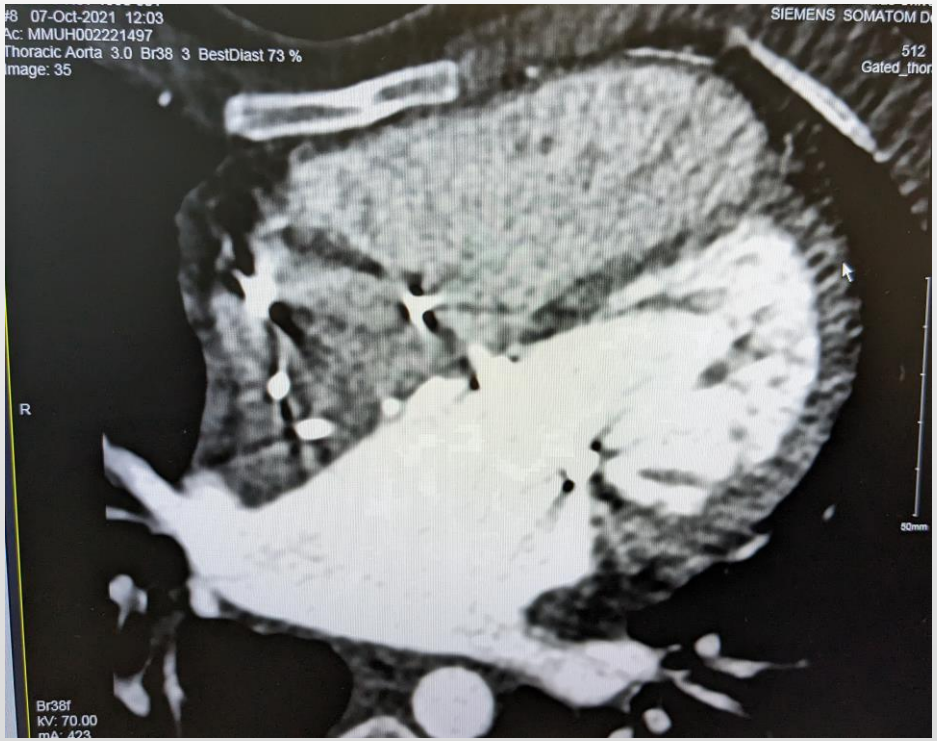
Case example from reoperation in adulthood

- 31 yr old female,
- Complete AVSD with pulmonary stenosis repair as a child in Moldova
- Age 24 had severe mitral and tricuspid regurgitation and underwent mechanical mitral valve replacement, tricuspid valve repair with an annuloplasty, and pulmonary valvotomy in Moldova
- Post-op complete heart block and transvenous DDD pacing system placed.
- Age 31, moved to Ireland and referred to the ACHD service with right heart failure – peripheral oedema, ascites, NYHA class 2 Dyspnoea.
- Noted to have severe tricuspid and pulmonary regurgitation and moderately reduced Left ventricular function.
- Failure to respond to medical optimisation with persistent poor exercise capacity, ascites.

Case example from reoperation in adulthood

Pre-op work-up to assess co-morbidities:

- Small patient 45Kg, but low BMI 19
- Cath showed normal PA pressures and PVR
- ECG showed wide QRS suggesting significant intraventricular conduction delay.
- Type 1 DM since childhood – normal creatinine clearance
- Hypothyroidsm – on adequate treatment
- U/S liver showed coarse echotexture consistent with micronodular cirrhosis. Work-up suggested secondary to chronic congestion. MELD C risk level.
- Atrial flutter, rate controlled on beta blockers
- Moderate Pectus excavatum defect, CT scan showed Right ventricle indented by pectus defect.
- Significant discussions on 3 occasions with patient and partner re perioperative risk of death/decompensated liver failure.



Case example from reoperation in adulthood

Operative procedure:

- Elective right femoral access for bypass commencement before redo sternotomy due to RV indented by Pectus defect (24fr EOPA via 8mm graft on artery, 21fr multistage venous).
- Small partial thickness injury to anterior surface of RV repaired with interrupted 5-0 prolene sutures.
- 2nd venous cannula 24fr via innominate vein for full bypass.
- On crossclamp - Removed transvenous pacing leads, Noted scarred shrunken leaflets of tricuspid valve with some perforations, annulus not significantly dilated due to previous annuloplasty- replaced with 25mm Perimount magna ease bioprosthetic valve. Pulmonary valve replaced with 27mm pulmonary homograft. Biventricular epicardial DDD pacing system inserted for resynchronisation.

Case example from reoperation in adulthood

Post-op:

Extubated day 2

Stayed on milrinone for 7 days with IV diuresis

Careful management of fluid balance, nutrition (NG fed), Blood sugars, bridged with IV heparin to warfarin.

Discharged after 4 weeks.

Follow-up now 1.5 years later:

Good biventricular function, No TR or PS/PI.

No Dyspnoea, excellent walking distance.

Ascites and peripheral oedema resolved, now only once daily diuretics.

Recent liver U/S shows only mildly coarse echotexture.

Some atrial tachycardias that required amiodarone with beta blockers.

So what can we say to families and reoperations?

- The risk of a reoperative cardiac surgery is: 6-13% at 10 yrs and up to 20% at 20 yrs
- The median time to reoperation will be 1-2 years after the first surgery
- The main reasons for reoperations are left AV valve regurgitation and subaortic stenosis
- In the case of left AV valve regurgitation repair is possible in 50-80% with the first reoperation and the most common technique is cleft closure and annuloplasty.
- In the case of subaortic stenosis, a resection of tissue via the aortic valve and LVOT myectomy is sufficient in most patients.
- Reoperation mortality is between 0-7% with good recovery in most cases.
- Ongoing review is necessary post-op as up to ¼ of reoperation patients may develop a recurrence of their original issue.