Spotting zebras!
Overcoming the challenges of **Kawasaki Disease** *diagnosis*

Kawasaki Disease
clinician information guide

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If a child has a **PERSISTENT FEVER**
and two or more of these symptoms
THINK KAWASAKI DISEASE

Persistent fever

Cracked lips/ ‘strawberry’ tongue

Rash

Swollen or red fingers/toes

Bloodshot eyes

Swollen glands

This is an information pack prepared to support a workshop session at RCPCH conference. It has been produced based on a RCPCH training webinar given by Professor Robert Tulloh and Professor Paul Brogan. We’d actively encourage you to watch the webinar which provides an excellent training session for staff teams. To watch the webinar, please visit **here** or **click the QR code** below. If this document has been printed, please **scan the QR code**:

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Time to 'THINK Kawasaki Disease'

Thank you for your interest in Kawasaki Disease!

Kawasaki Disease is the leading cause of acquired heart disease in children in the western world – outcomes have not improved in 3 decades. It's time we changed that!

By the end of this booklet and workshop session, you will:

- **Understand diagnosis** considerations – including differences of presentation and when to **THINK Kawasaki Disease**
- Have **knowledge of differential diagnosis** issues and red flags for Kawasaki Disease
- Have **knowledge of the urgency** with which the disease needs to be treated – and the confidence to consider Kawasaki Disease
- Have **awareness of disease severity** and the criticality of EARLY treatment
- **Abandon prevailing 'myths'** around this disease which are hampering treatment / adversely impacting children affected

Persistent fever

Cracked lips/ 'strawberry' tongue

Rash

Swollen or red fingers/toes

Bloodshot eyes

Swollen glands

Kawasaki Disease Epidemiology

Epidemiology

- Medium vessel vasculitis
- Predilection for coronary arteries
- World wide distribution
- Male preponderance 2:1
- Commoner in children of Black African descent in the UK
- Some seasonality and occasional epidemics – UK winter/spring peak

- Japan[1] 20141: 322/100,000 (<5 years)
- South Korea: 134.4/100,000
- USA: 19-25/100,000
- Skane, Sweden: 5.5/100,000
- **UK 4.55 (BPSU) - 9.1 (THIN) /100,000[2]**
- **Fourfold increase in hospital admissions (England) 2006-2018[3]**

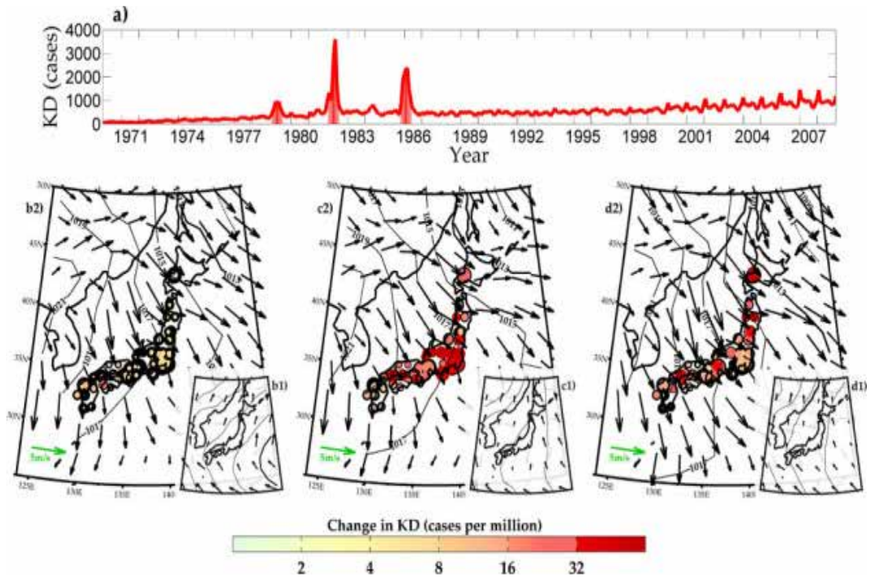
1. 23rd National survey; Makino et al 2018 2. BPSU - Tulloh RM et al Arch Dis Child 2019;104:640-646 / THIN – BJGP 2016;66:e271-6 3. Societi Foundation FOI 2019

Cause of Kawasaki Disease?

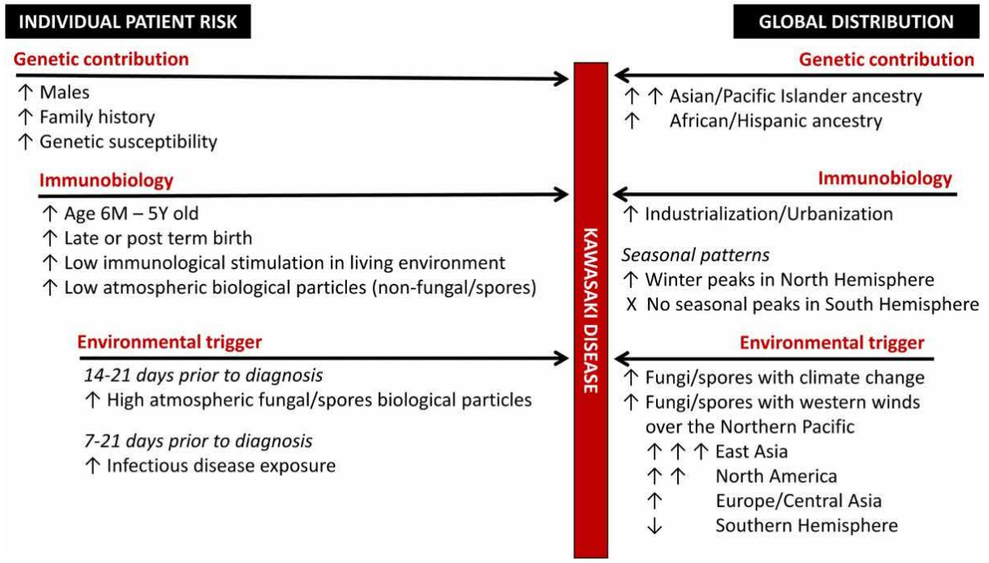
Infection or toxin?

Infection or toxin?

- **Blowing in the wind?** A theory
- **Seasonality** - Kawasaki Disease is somewhat seasonal
- **Age of onset** - 0-5 years but 25% patients are more than 5 years old
- **No single infectious cause found** - research is ongoing
- Wind patterns confirm wind correlates with season variation I
- GWAS Variants - TGFB2 SMAD3
- Polymorphism in FCGR2A receptor - immune activation



Environmental epidemiology



Environmental epidemiology of Kawasaki disease: Linking disease etiology, pathogenesis and global distribution

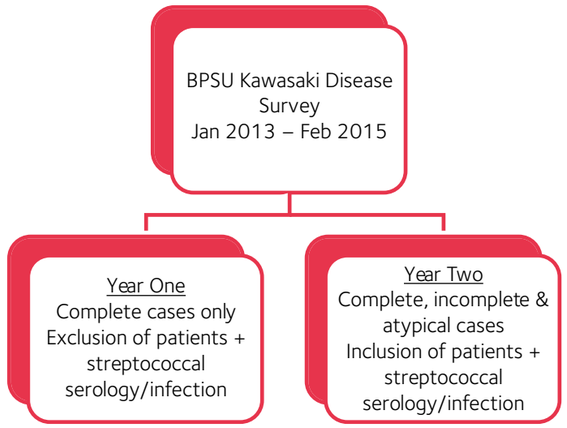
Cedric Manlhiot, Brigitte Mueller, Sunita O'Shea, Haris Majeed, Bailey Bernknopf, Michael Labelle, Katherine V. Westcott, Heming Bai, Nita Chahal, Catherine S. Birken, Rae S. M. Yeung, Brian W. McCrindle

Approach – UK & Ireland BPSU Survey

UK BPSU Survey 2013 - 2015:

Approach taken

- Incidence: demographics (sex, age, ethnicity)
- Clinical Presentation: Link between symptoms and presentation
- Clinical Management: What acute treatment is being given?
- Outcome: What are the complications at 30 days?



Tulloh RM et al Arch Dis Child 2019;104:640-646

Results - demographics

Demographics:

- 601 children notified
  - 10 not KD
  - 37 duplicates
- 553 included in study
  - 215 girls, 323 boys
  - F:M 1:1.5
  - 2m-15yrs age range

Age (yrs)	No. Children
Less than 5	422
Older than 5	131
Total	553

Type	No. Children
Complete	389
Incomplete	162
Post mortem	2

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Results - Ethnicity

Ethnicity:

The number of Black and mixed White & Black, and other is higher than expected (only 7% of UK population is in these ethnic groups).

Ethnic group	No. Children	% of reported
White	356	68%
Black (African+Caribbean)	47	9%
Indian Subcontinent	41	8%
Chinese	16	3%
Japanese	4	1%
Mixed	38	7%
Other	22	4%
TOTAL	553	

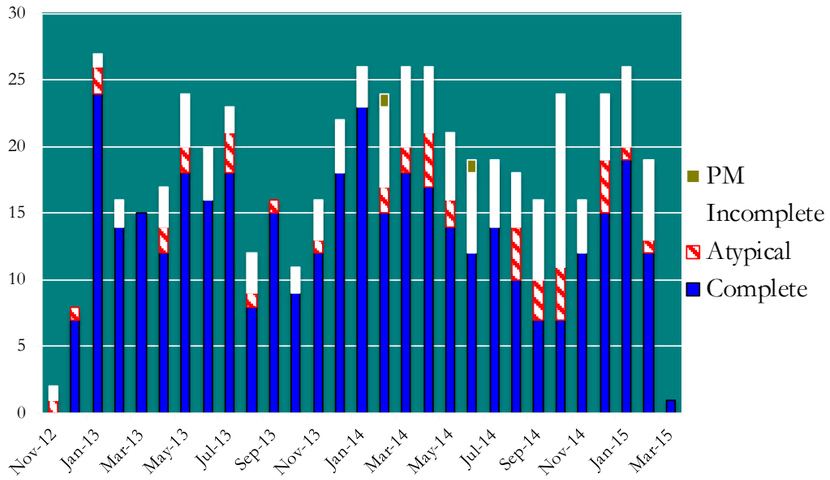
It is noted that we found an excess representation of Black Africans or mixed Black and White ethnicity in our population. If you look at the seasonality of presentation, the cases were more likely to present in January and in the summer months each year, possibly associated the incidence with prevailing weather patterns.

Tulloh RM et al Arch Dis Child 2019;104:640-646

Results - CAA and seasonality

Cardiac sequelae:

	CAA+	CAA-	Total
Dec - May	78	239	321
June - Nov	49	160	215
Total	127	399	553



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Results - regionality

Regionality:

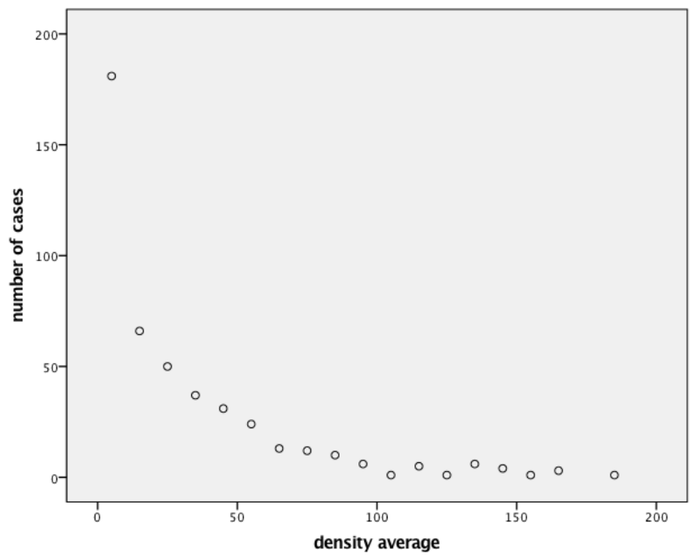
Country/Region	No. cases	Region	No. cases
Scotland	33	West Midlands	41
Eire	31	East Midlands	27
Wales	37	East of England	51
Northern Ireland	12	London	84
North East Region	16	South East	78
Yorkshire and Humberside	34	South West, Inc. C.I.	53
North West/IoM	53	**Total**	**553**

Kawasaki Disease is seen in all areas

BPSU - Tulloh RM et al Arch Dis Child 2019;104:640-646

Inverse relationship to urbanicity

Inversely related to urbanicity per sq Km:



Very strong relationship with rurality - higher incidence in children from rural areas

Diagnosis

Diagnosis:

- 441 (80%) saw a GP between the onset and admission
- Median time from first symptom to GP was 2 dy (0-27)
- Median time from GP to admission was 1 dy (0–32)
- Median time from onset to diagnosis was 7 dy (0-36)
- Median time admission to diagnosis was 1 dy (0-25)

Diagnosis	CAA+	CAA-	Total
< 8 days	62 (48%)	231 (58%)	298
8-14 days	45 (36%)	105 (26%)	151
15+days	16 (13%)	49 (12%)	66
Total	127	399	553

BPSU - Tulloh RM et al Arch Dis Child 2019;104:640-646

Results - key findings

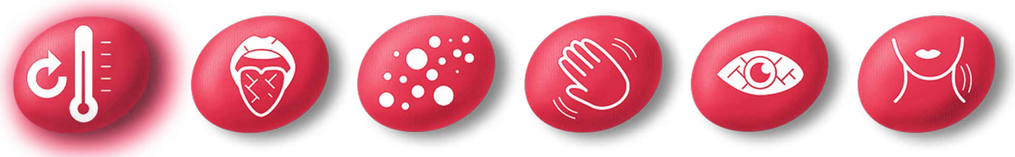
UK BPSU Survey 2013 - 2015:

- 47% cases were incomplete Kawasaki Disease in infants
- 28% all cases were incomplete Kawasaki Disease

BE ALERT to incomplete Kawasaki Disease - If you see a child with persistent fever plus 2 or more symptoms **– THINK Kawasaki Disease!**

EARLY treatment is critical - DON'T DELAY

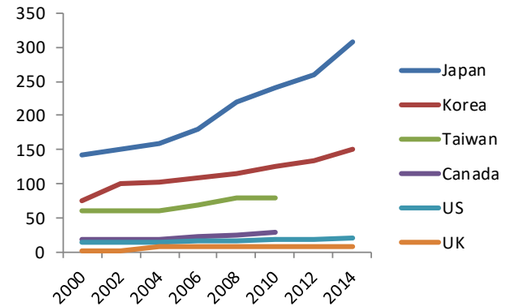
- 39 % infants develop coronary artery aneurysms
- 28% all children have some heart complications
- 19% of all children develop coronary artery aneurysms
- More common in rural areas
- Higher incidence in black and minority ethnic groups
- Seen more often in winter / spring
- Increasing delay in treatment = increasing risk of cardiac complications

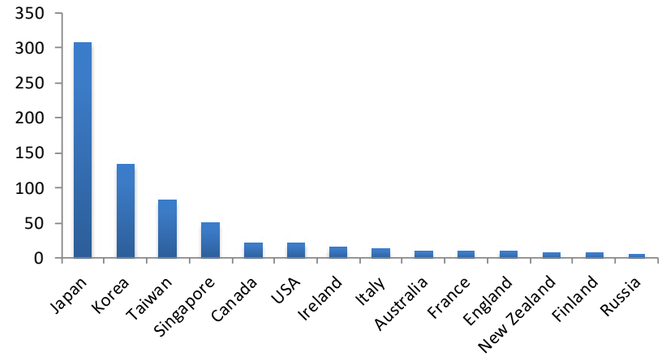


Incidence doubling every 10 years

Incidence:

- Increasing worldwide – graphs show incidence per 100,000 children <5 years
- Commonest cause of acquired heart disease in children - more common than rheumatic fever acquired heart disease
- Up to 47% cases in UK/Ireland infants under 1yr are incomplete
- 28% of all cases in UK/Ireland are incomplete

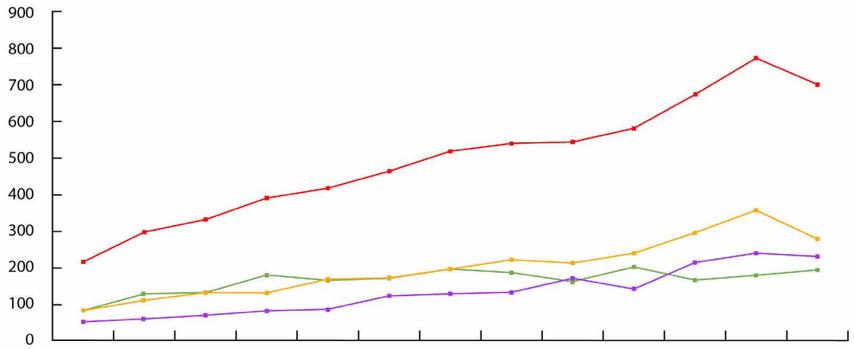




Makino N Pediatrics 2018 epub Hall E, Tulloh RM Br J Gp 2016;66:271

Increasing admissions – England (2006–2018)

Societi data shows rapidly rising number of hospital admissions in England



	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Female	51	59	69	81	85	122	128	132	170	141	213	239	230
Male	82	110	131	130	168	171	195	221	212	239	295	356	278
Unknown	82	128	131	179	164	170	195	186	161	201	165	178	193
Total	215	297	331	390	417	463	518	539	543	581	673	773	701

McCormack R Societi Foundation, Freedom of information request July 2018

Clinical features

"Classical" Kawasaki Disease is currently diagnosed with fever plus any 4 of these symptoms

BUT! Fever of >5 days duration PLUS 2 or more features - THINK Kawasaki Disease:

Persistent fever:

Persistent high fever. Can be unremitting with anti-pyretics, may be spiking and can come and go. Parental/carer reports of very high fever should form part of the case history.

Polymorphous rash:

Rash can take may forms. Could appear like eczema and in eczema locations. Can appear as 'sun burn'. Can be fleeting - case history is important.

Oropharyngeal changes – "strawberry" tongue, cracked lips:

Lips can be cracked and dry, so called 'lipstick sign' and painful and sore. Sore throat, dry mouth. 'Strawberry tongue' - whilst often shown in images to be bright red, may present as white 'strawberry tongue' with bumps initially.

Bilateral non-purulent conjunctival injection - non-exudative:

Bloodshot, non-sticky conjunctivitis. Remember red eyes do not appear in Scarlet Fever - this is a key differentiator. Area of pallor adjacent to the iris known as limbic sparing, typical of the conjuctival injection which can be part of the immune response with Kawasaki Disease.

Changes in peripheral extremities, redness and swelling:

Erythema - reddened hands and feet with swelling. Can be very distinctive and cause discomfort. Puffy hands and feet sometimes referred to as indurative oedema.

Cervical lymphadenopathy – often just one side:

Will be pronounced and enlarged - text books often refer to specific sizes (who measures these?!) If tender and prominent consider Kawasaki Disease.

Do not wait for 5 days of fever if you have suspicion of Kawasaki Disease. **TREAT!**

Symptoms may appear in series and not all at the same time.

BE ALERT to incomplete Kawasaki Disease - If you see a child with persistent fever plus 2 or more symptoms -

THINK Kawasaki Disease!

More clues to **Kawasaki Disease**

More clues:

- Perineal rash
- BCG scar inflammation

Cardiac clues:

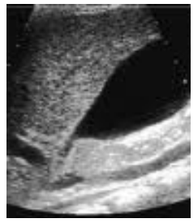
Echo Findings

N.B. Do not delay treatment pending echo findings!

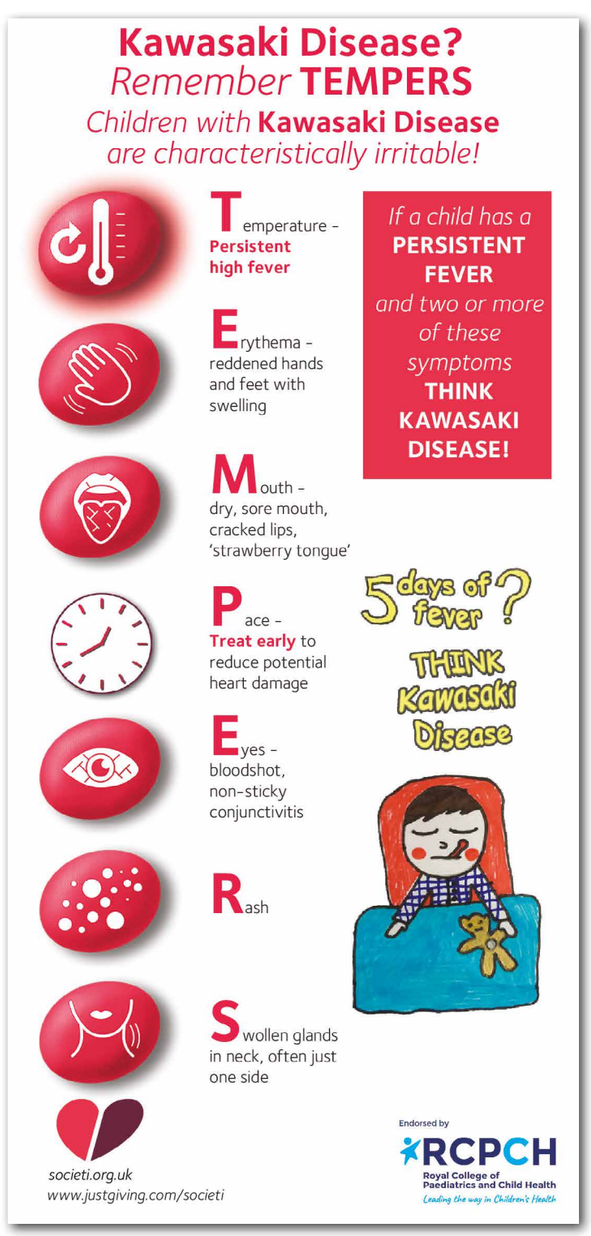
- Inflammation of coronary arteries and coronary artery aneurysms
- Pericarditis
- Valvulitis
- Myocarditis

Other clues:

- Irritability – irritability – irritability! Remember TEMPERS! Children with Kawasaki Disease are characteristically and disproportionately irritable
- Diarrhoea / abdominal pain
- Aseptic meningitis
- Urethritis
- Uveitis
- Hydrops of gallbladder



Hydrops of gallbladder



Later clues to diagnosis

Later clues:

Skin peeling – sub acute feature: 10 – 25 days after fever onset

N.B. Absence of skin peeling is NEVER a basis on which to dismiss a diagnosis of Kawasaki Disease!

Skin peeling is a late sign, part of the healing process of Kawasaki Disease.

Presentation considerations

Presentation considerations:

- Infant – may present with persistent fever and rash – and few other features. Features may be mild or unapparent. Early diagnosis of Kawasaki Disease in this age group is essential as 39% develop CAA
- Young child – remember sequential presentation of features – full and detailed clinical history is critical
- Older child – this group tends to experience delays in diagnosis. Clinical presentation may also include vomiting, diarrhoea, sore throat
- 47% of UK & Ireland infant cases present as incomplete Kawasaki Disease; 28% of cases overall are incomplete – high index of suspicion is needed!

BPSU - Tulloh RM et al Arch Dis Child 2019;104:640-646

Investigations

Investigations:

- Clinical features
- CRP / ESR raised
- WBC raised
- Albumin low
- Sodium low
- Viral titres/ ASOT/ Throat swab negative
- Platelets lower early/ raised later (>10/7)

Risk factors – cardiac sequelae

Risk factors – cardiac sequelae:

- Age under 1 year : 39% have coronary artery aneurysms despite treatment
- Few clinical features (contributes to late diagnosis)
- Low albumin, low platelets, high CRP, male
- Late treatment:
- In BPSU Study those without coronary artery aneurysms were treated at 6.8 days
- Those with coronary artery aneurysms were treated at 10.2 days
- 1.6% had Giant coronary artery aneurysms

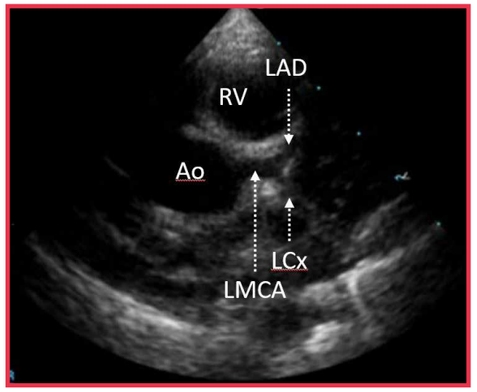
EARLY treatment is critical - DON'T DELAY

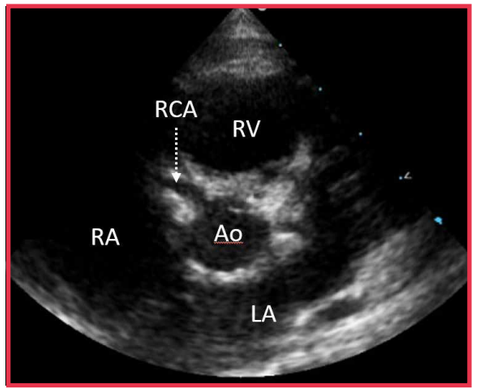
SO: Any infant with prolonged fever, **THINK Kawasaki Disease** and treat if you suspect the diagnosis: EARLY ECHOCARDIOGRAM; but **don't delay** treatment awaiting an echo!

Investigations - echocardiography

Investigations:

- Routine technique
- Full study - Don't just think coronary
- Myocarditis
- Pericardial effusion
- Valve regurgitation





LMCA left main coronary artery, LCx left circumflex coronary artery, LAD left anterior descending coronary artery, RCA right coronary artery, Ao aortic valve, RV right ventricle, RA right atrium, LA left atrium

Tulloh RM Personal Library

Investigations - echocardiography

Left CA views:

LMCA (left main coronary artery)

- Parasternal short axis view at level of aortic valve; precordial parasternal long axis view of left ventricle (superior tangential)
- Subcostal (ventricular) long axis

LAD (left anterior descending coronary artery)

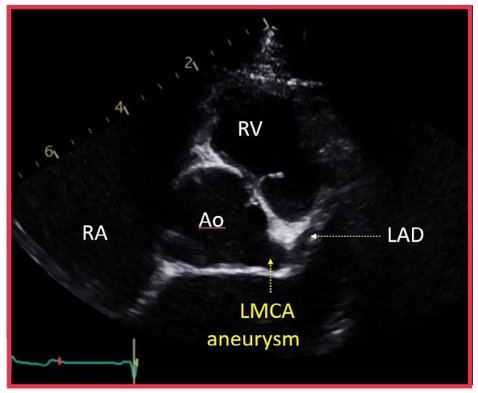
- Parasternal short axis view at level of aortic valve
- Parasternal superior tangential long axis view of left ventricle
- Parasternal short axis view

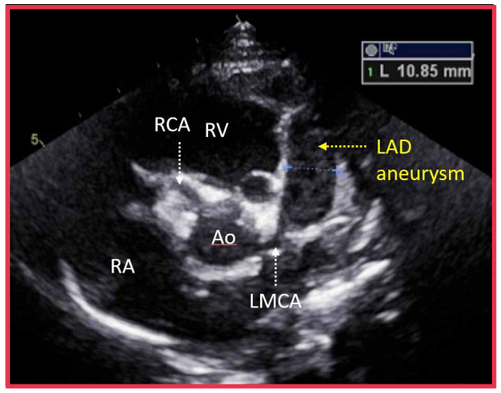
LCx (left circumflex coronary artery)

- Parasternal short axis view at level of aortic valve; apical 4-ch

McCrindle BW Circulation 2017;135:927-999

Images LMCA/LAD:





LMCA left main coronary artery, LAD left anterior descending coronary artery, RCA right coronary artery, Ao aortic valve, RV right ventricle, RA right atrium

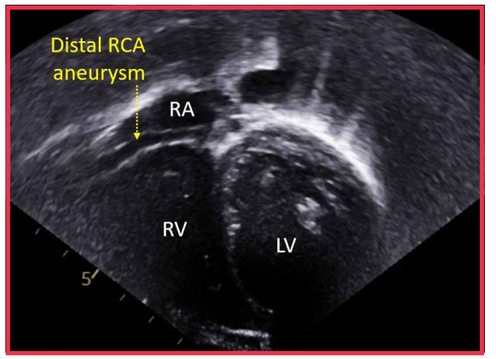
Kucera F Personal Library

The parasternal short axis is the easiest and most routine view for imaging the proximal coronary arteries. However, don't forget to use all the other views to see the coronaries in different planes. It would be easy to miss a large aneurysm, because the coronary may be so big that it does have the normal shape or structure of a normal coronary artery.

Investigations - echocardiography

Giant CAA – cardiac anatomy:

Sometimes the coronary arteries are unusually well visible in places where they are usually difficult to visualize, such as the right atrioventricular groove (first picture) or interventricular sulcus (second picture). THINK - are they dilated?



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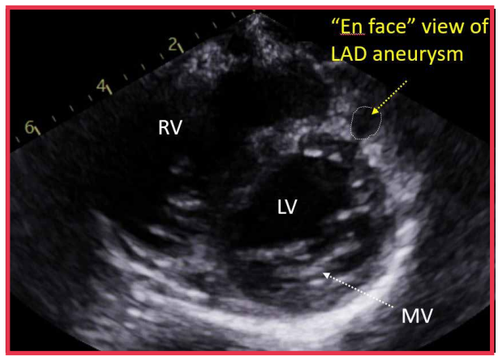

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Right CA views:

RCA, proximal segment

- Parasternal short axis view at level of aortic valve
- Parasternal long axis view (inferior tangential) of left ventricle
- Subcostal coronal projection of right ventricular outflow tract
- Subcostal short axis view at level of atrioventricular groove

RCA, middle segment

- Parasternal long axis view of left ventricle (inferior tangential); apical 4-chamber view
- Subcostal (left ventricular) long axis view; subcostal short axis view at level of atrioventricular groove
- RCA proximal (#1) and mid (#2) are observed in the atrioventricular groove from the third intercostal space at the left and right sternal border

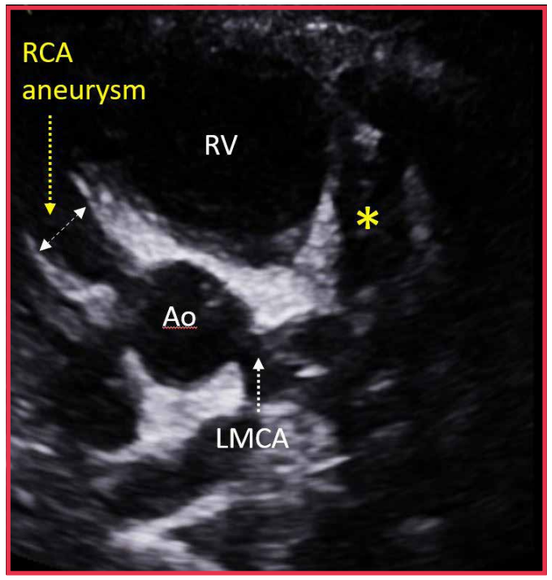
RCA, distal segment

- Apical 4-chamber view (inferior); subcostal atrial long axis (inferior)

Investigations - echocardiography

RCA (right coronary artery):

It is important to measure the internal diameter of the coronary artery and to relate to normal by means of a z score. Here the measurement of the dilated proximal right coronary gave a z score of +22. There is also dilatation of the left coronary artery and in particular of the left anterior descending coronary artery (star).



RCA right coronary artery, LMCA left main coronary artery, Ao aortic valve, RV right ventricle

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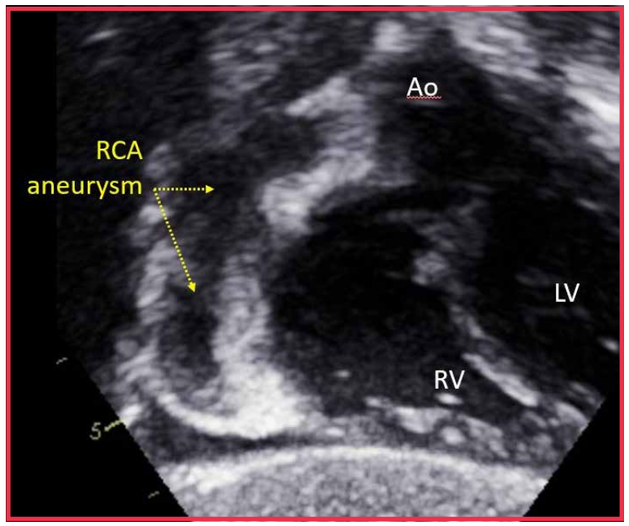
Images RCA:

Severely aneurysmal right coronary artery seen from subcostal long axis view.



Ao aortic valve, LV left ventricle, RV right ventricle

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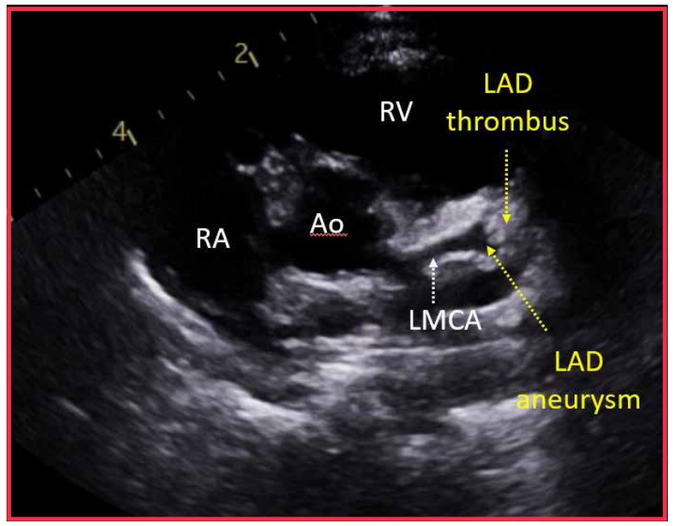
Investigations - echocardiography

Posterior descending coronary artery:

- Apical 4-chamber (inferior)
- Subcostal atrial long axis (inferior)
- Precordial long axis (inferior tangential) imaging
- Posterior interventricular groove

Coronary thrombosis

It is also important to look for the possible presence of coronary thrombi. This example demonstrates a thrombus in a fusiform LAD aneurysm.



Ao aortic valve, RA right atrium, RV right ventricle, LMCA left main coronary artery, LAD left anterior descending coronary artery

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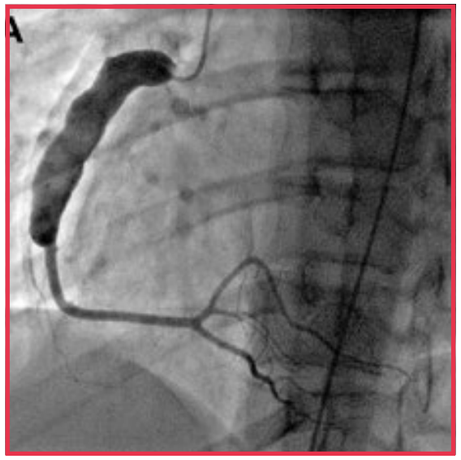
Coronary aneurysm

Acute Kawasaki Disease mortality:

If the child is not treated, then the mortality of the condition is much higher.

- Lowered with treatment
- 0.36% - treated
- 2-3 % - untreated

Giant CAA



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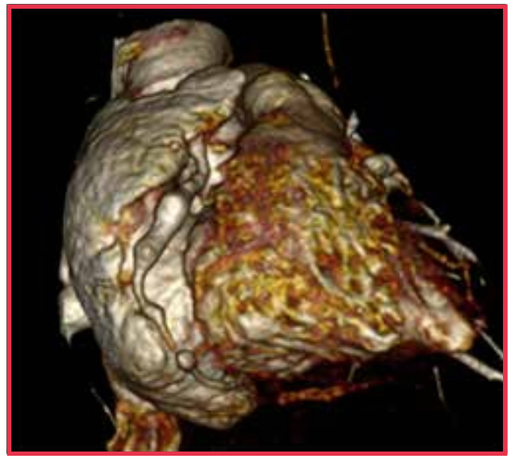

Courtesy to Dr O Tann

Conventional invasive angiogram (first picture) and CT angiogram in different patients demonstrating fusiform right coronary artery aneurysm.

A post mortem case is seen of an aneurysmal coronary artery - not recognised as part of Kawasaki disease during life.

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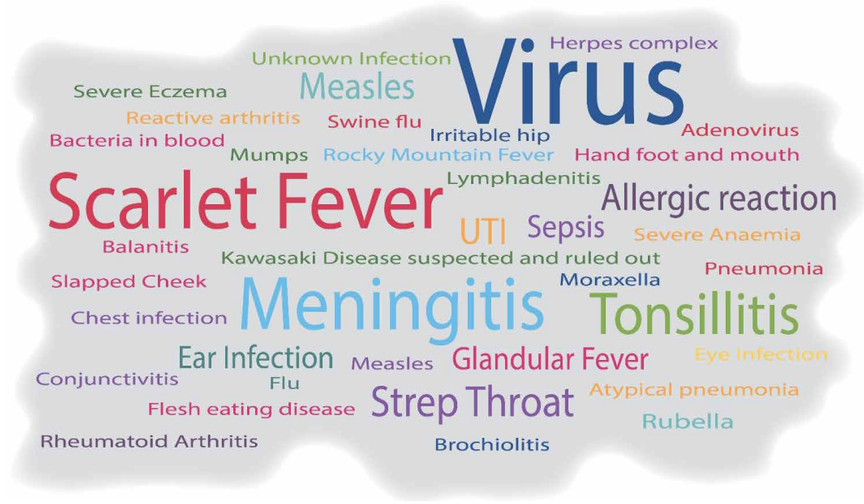
Differential diagnosis

Differential diagnosis:

Significant consequences arise from this disease – yet it remains under-recognised and frequently misdiagnosed. Consider differential diagnosis:

- Scarlet fever (does not cause red eyes)
- Viral infection
- - adenovirus, enterovirus, measles, parvovirus, Epstein–Barr virus, cytomegalovirus
- Meningitis – if you're considering Meningitis – **THINK Kawasaki Disease**
- Systemic juvenile idiopathic arthritis (sJIA)
- Other vasculitides
- Lymphoma

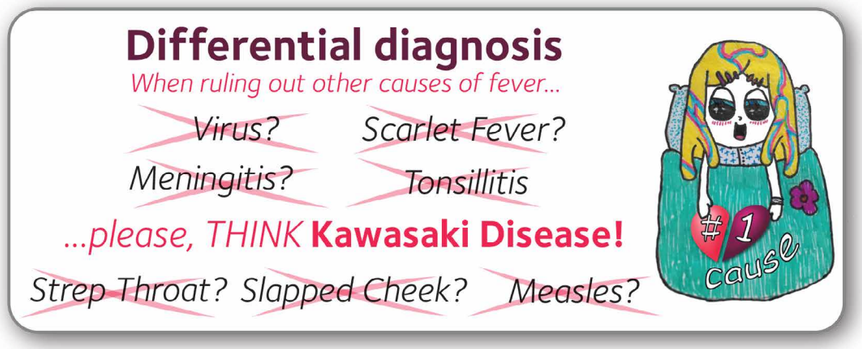
Societi Foundation review of the diagnoses given to UK children prior to eventual diagnosis with Kawasaki Disease indicates these prior incorrect diagnoses – by proportion



McCormack R Societi Foundation, Diagnosis Day experience June 2018

Persistent Fever PLUS 2 or more features –

THINK Kawasaki Disease



Diagnosis delay - consequences

Diagnosis delay - consequences:

- **DELAY!** Children being diagnosed on average at 7.8 days – TOO LATE!
- Children treated after 7 days = increasing risk of cardiac damage
- Risk increases proportionately with increasing delay
- 28% children have some heart damage
- 39% infants develop coronary artery aneurysms
- 19% all children affected develop coronary artery aneurysms

EARLY treatment is critical - DON'T DELAY

- These patients – need LIFELONG specialist cardiac care
- These patients – increased risk of major cardiac events in later life
- These patients – increased risk of sudden death

BPSU - Tulloh RM et al Arch Dis Child 2019;104:640-646

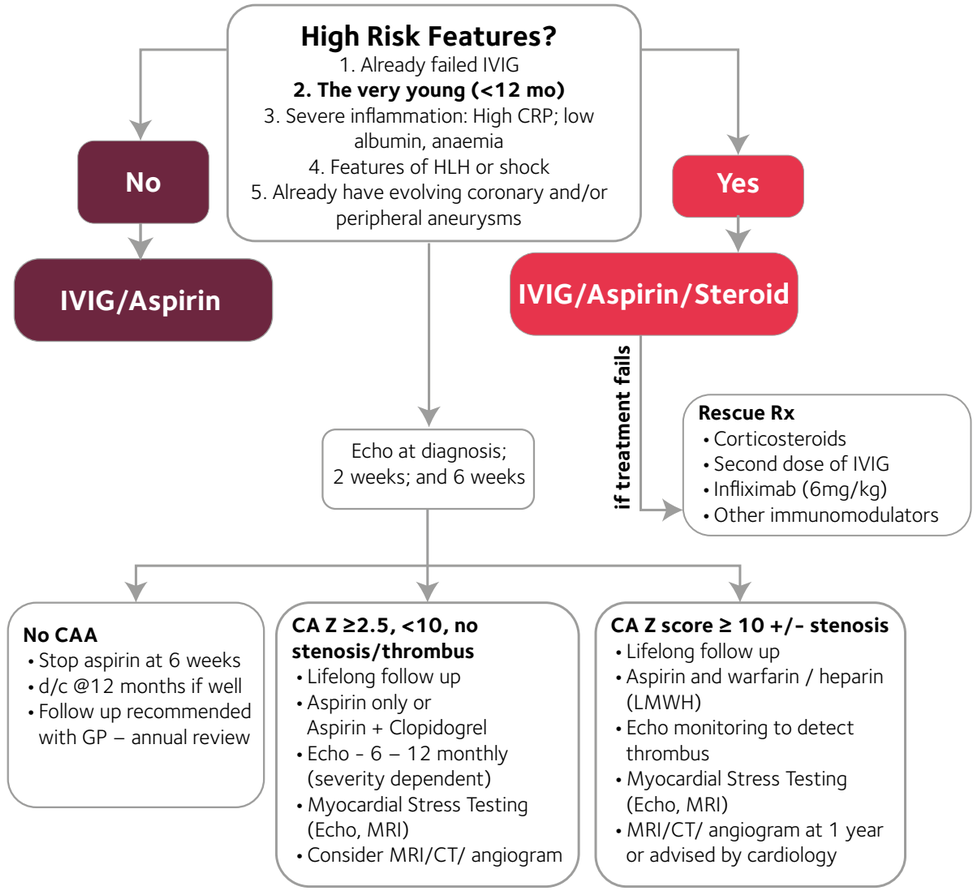
Tackling diagnosis delay

Tackling diagnosis delay:

- Recognise that Kawasaki Disease is increasingly common – **seen more than some bacterial meningitis**
- Remember sequential presentation of signs – ensure a detailed clinical history
- Incomplete Kawasaki Disease – 47% of cases in infants and 28% of cases overall
- Reluctance to diagnose because worried about ruling out infection e.g. scarlet fever
- Essential to have an increased index of suspicion – **THINK Kawasaki Disease**
- With increasing incidence – outcomes have not improved in 3 decades - time for change!
- **EXPECT to see Kawasaki Disease – and be READY to treat it!**

High risk features

High risk features:



Management

As soon as diagnosis is made:

- Immunoglobulin 2g per kilogram IV - single dose over 12hrs
- Aspirin 10mg per kilogram 4 times a day
- Supportive management, cream to fingers etc
- Perform an ECG alternate days
- Echocardiography – at diagnosis at 2 weeks and at 6 weeks
- Reduce to low dose aspirin as fever/markers resolve - 5mg per kilogram per day
- Do not repeat blood tests unless required
- Difficult cases require re-treatment with immunoglobulin + corticosteroids

N.B. IVIG resistance – 15 – 20%

- IVIG resistant patients have poorer prognosis - Risk of CAA: 20 – 30%

- Other treatments include:
  - Anti-TNF (infliximab)
  - Anti IL-1 (anakinra)
  - Ciclosporin

Other treatments

Corticosteroids:

Corticosteroids have been shown as beneficial in the prevention of coronary artery aneurysms in Kawasaki Disease.

- RAISE study: Kobayashi et al. Lancet 2012
  - N=253: IVIG/aspirin Vs IVIG/prednisolone/aspirin
  - **23% CAA in standard Rx group, Vs 3% in steroid group (NNT 5)**
- **Two meta analyses in 2012: both unequivocally show benefit of corticosteroids for the prevention of CAA**
  - Chen et al Heart Aug 2012
  - Zhu et al EJ Paeds Mar 2012
- Tulloh RMR, Mayon-White R, Harnden A, et al
  Kawasaki disease: a prospective population survey in the UK and Ireland from 2013 to 2015
  Archives of Disease in Childhood 2019;104:640-646
- Green J, Wardle A, Tulloh RMR. corticosteroids for the treatment of Kawasaki disease in Children. Cochrane database of systematic reviews 2022;5:1465-1858 - https://doi.org//10.1002/14651858.CD011188.pub3

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Other treatments

Other treatments:

- 2,746 Kawasaki Disease patients
- Early addition of corticosteroids to conventional IVIG therapy was associated with reduced risk of CAA compared with IVIG therapy alone: odds ratio 0.424 (95%CI, 0.270-0.665)
- Corticosteroids were more effective when started earlier in the disease course

JAMA Pediatrics | Original Investigation

Coronary Artery Complication in Kawasaki Disease and the Importance of Early Intervention
A Systematic Review and Meta-analysis

Shaojie Chen, MD, MM, PhD; Ying Dong, MD, MM, PhD; Marcio Galindo Kiuchi, MD, MS, PhD; Jiazhi Wang, MD; Ruotian Li, MD, PhD; Zhiyu Ling, MD, PhD; Tingquan Zhou, MD, PhD; Zhenglong Wang, MD, PhD; Martin Martinek, MD; Helmut Pürerfellner, MD; Shaowen Liu, MD, PhD; Mitchell W. Krucoff, MD

CONCLUSIONS AND RELEVANCE This study highlights the importance of timing to prevent coronary artery complication in treating KD. High-risk patients with KD benefit greatly from a timely and potent adjunctive corticosteroid therapy strategy.

JAMA Pediatr. 2016;170(12):1156-1163. doi:10.1001/jamapediatrics.2016.2055
Published online October 17, 2016.

Longer term management

Some children will present with severe coronary artery dilation and are at high risk of thrombosis, or this may already be present.

For those with thrombosis present, multi-department discussion should take place to define the optimum treatment for that child, but it is likely to consist of heparinisation and possible thrombolysis. This needs to take place where acute paediatric haematology support is available.

For longer term management, more information is available in the publication:

Brogan P, et al: Lifetime cardiovascular management of patients with previous Kawasaki disease. Heart 2020 Mar;106(6):411-420.doi: 10.1136/heartjnl-2019-315925.Epub 2019 Dec 16

It is beyond the scope of this publication to give specific details, but the authors can be contacted for further advice. Most notably, those children with giant coronary artery aneurysms are at high risk of acute thrombosis within the first 2 years of presentation. They should be managed with anticoagulation plus additional aspirin, in order to reduce the risk of acute myocardial ischaemia.

Table 1: Classification of coronary artery dilation or aneurysms (after AHA guidance with modification) – *(Brogan P, et al: Lifetime cardiovascular management of patients with previous Kawasaki disease. Heart 2020 Mar;106(6):411-420.doi: 10.1136/heartjnl-2019-315925.Epub 2019 Dec 16)*

Classification of risk level	Description of coronary arteries	Follow-up interval	Imaging required to assess for inducible ischaemia (stress echo or stress MRI)	PSP	Regional specialist Kawasaki disease clinic
1	No involvement at any time point (Z score<2)	2 weeks 6 weeks 6 months 12 months Discharge if normal at 12 months.	None	No	No—annual cardiac and general health review with GP recommended*
2	Dilation only (2<Z score≤2.5): resolves within 1 year	2 weeks 6 weeks 6 months 12 months Discharge if normal at 12 months	None	No	No—annual cardiac and general health review with GP recommended*
3	Small aneurysm (2.5≤Z score<5): (a) current or persistent, (b) decreased to normal or Z score <2.5	2 weeks 6 weeks 6 months 12 months Annual review	Coronary angiography (preferably CT) at 12 months as baseline. Consider stress imaging for inducible myocardial ischaemia every 2 years. Imaging (echo) for coronary surveillance annually	Yes	Yes
4	Medium aneurysm (5≤Z score<10): (a) persistent aneurysm, (b) decreased to normal or Z score<2.5	2 weeks 6 weeks 6 months 12 months Annual review	Coronary angiography (preferably CT) at 12 months as baseline. Consider stress imaging for inducible myocardial ischaemia annually. Imaging (echo, CT† or MRI) for coronary thrombus surveillance annually.	Yes	Yes
5	Giant aneurysm (Z score≥10 or ≥8 mm): (a) persistent giant aneurysm, (b) persistent aneurysm (but regressed to medium or small aneurysms), (c) regressed to normal dimensions	2 weeks 6 weeks 3 months 6 months 9 months 12 months Then every 6 months	Coronary angiography (preferably CT) at 6–12 months as baseline. Consider stress imaging for inducible myocardial ischaemia annually. Imaging (echo, CT† or MRI) for coronary thrombus surveillance 6 monthly.	Yes	Yes

*GP review should include clinical examination, blood pressure measurement, general health discussion and advice on avoidance of cardiovascular risk factors and lifestyle choices—including maintaining a healthy weight, reducing risk of diabetes, avoiding smoking and taking regular exercise. This provides the opportunity to discuss any parent or patient questions and concerns.

†CT should not be used repeatedly if possible. Use MRI or ultrasound where possible, to reduce radiation exposure.

ADP, Adenine di-Phosphate; AHA, American Heart Association; FBC, Full blood count; GP, General Practioner; PSP, person-specific protocol.

Kawasaki Disease - therapeutic pitfalls

Therapeutic pitfalls:

- **Delay in treatment**
- Failure to recognise high risk cases
- Over-reliance on resolution of fever as metric of therapeutic success: **must aim for zero fever, zero CRP**
- "No point in treating beyond day 10" - this is a myth! If inflammation is active - treat!
- Not treating incomplete cases - these are high risk cases - **must not delay treatment**

EARLY treatment is critical - DON'T DELAY

Management & follow-up

As soon as diagnosis is made:

- Echocardiogram
  - at 10 days, 6 weeks (stop aspirin if normal)
  - at 6 months
- Long term follow up by GP (no CAA persisting @ 6 wks)
- Lifetime follow up by cardiologist (CAA persists @ 6 wks)
- Recurrence 1 in 50
- "Reactivation" and re-peeling common

PLUS

- Societi - UK Foundation for Kawasaki Disease - detailed parent & family information at www.societi.org.uk - includes details of UK parent support group
- Societi "Longer Term Issues" parent & carer information leaflet www.societi.org.uk

Cardiac sequelae – long term

Cardiac sequelae:

- 500 patients with coronary artery aneurysms
- 35-year period
- Regression of CAA in 75%
- 24 patients had Major Adverse Cardiac Events (3x death, 1x heart transplant, 6x coronary artery bypass graft, 1x percutaneous coronary intervention, 2x symptomatic myocardial infarction, 8x asymptomatic myocardial infarction or coronary artery occlusion)

Friedman J Am Heart Assoc 2016

Giant CAA patients:

- 245 patients with giant CAA
- Median observational period 20 years
- 30-year cardiac event free rate was 36% and the survival rate was 90% (87% for bilateral and 96% for unilateral giant aneurysms).
- During follow up, death, acute myocardial infarction and coronary artery bypass graft occurred in 6%, 23% and 37%, respectively.

Tsuda Am Heart J. 2014

Cardiac sequelae – long term

Patient safety alert:

- Lifetime specialist cardiac management for all patients with CAA persisting after 6 weeks
- **Risk of death and serious harm**
- Long term clinical guidance for cardiac management published 2019

This patient safety alert can be downloaded by scanning or clicking the QR code below or visit the Societi website here.

Scan me

NHS Improvement

Patient Safety Alert

Stage One: Warning

Risk of death and serious harm from failure to recognise acute coronary syndromes in Kawasaki disease patients

11 May 2016

Alert reference number:	NHS/PSA/W/2016/004
Alert stage:	One - Warning

Around 10 to 20% of all children with Kawasaki disease (KD) develop aneurysms and are at long-term risk of thrombosis and/or stenosis of the coronary artery, which may result in coronary thrombosis and myocardial ischaemia or infarction in patients with KD related aneurysms. [1, 2]

Actions

Who:
All providers of NHS-funded care

Transition to adult care

Transition to adult care:

- Seamless transfer from paediatric to adult care is essential for this patient group
- BMI, blood pressure, lipids and HbA1c, hs-CRP
- ECG and echocardiography
- Consider stress echocardiography or stress MRI
- Consider Coronary CT angio (including calcium scoring)
- Review of Patient Specific Protocol
- Advice on lifestyle factors, smoking, diet and family planning (as applicable)
- Lifetime cardiovascular management of patients with previous Kawasaki Disease available in this pack

Recap

Recap on our aims:

- Understand the diagnosis considerations for Kawasaki Disease – including differences of presentation across ages, and when to THINK Kawasaki Disease
- Have knowledge of differential diagnosis considerations and red flags for Kawasaki Disease
- Have knowledge of the urgency with which the disease needs to be treated – confidence to consider Kawasaki Disease
- Have awareness of disease severity and the criticality of EARLY treatment
- Abandon prevailing 'myths' around this disease which are hampering treatment / adversely impacting children affected

Thank you!

Thank you:

Thank you for your interest in Kawasaki Disease. We hope the information in this resource has been helpful to you.

Incidence is on the rise, which means it is even more important to know Kawasaki Disease and ensure you can recognise it and treat it as early as possible.

There are lots of clinician resources and Kawasaki Disease information available to download from the Societi Foundation website. Please visit www.societi.org.uk to find out more and keep an eye out for updates as and when they occur.

With my very best wishes,

Professor Robert Tulloh
for Societi Foundation

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If a child has a **PERSISTENT FEVER** *and two or more of these symptoms*

THINK KAWASAKI DISEASE

Persistent fever

Cracked lips/ 'strawberry' tongue

Rash

Swollen or red fingers/toes

Bloodshot eyes

Swollen glands

societi.org.uk

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The UK Foundation for Kawasaki Disease

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