

PYLORIC STENOSIS

MODULE: PAEDIATRIC SURGERY

**TARGET: ALL PAEDIATRIC TRAINEES; PAEDIATRIC SURGICAL TRAINEES;
NURSING STAFF**

BACKGROUND:

Pyloric stenosis is a reasonably common paediatric surgical case (2-4 cases per 1000 live births in US). Surgical treatment is usually straightforward and overall mortality post-operatively is very low. However, these infants may present with severe dehydration and hypovolaemic shock and their initial management is key.

Paediatric trainees should be competent in diagnosing pyloric stenosis and in managing fluid resuscitation in these infants.

INFORMATION FOR FACULTY

LEARNING OBJECTIVES

By the end of this session, participant should:

1. Be able to diagnose likely pyloric stenosis on the basis of clinical history and blood gas results
2. Recognise that ongoing persistent vomiting (regardless of cause) can lead to electrolyte disturbances and significant hypovolaemia.
3. Understand the need for adequate fluid resuscitation and stabilisation of electrolytes and acid-base balance before surgical treatment.

SCENE SETTING

Location: Paediatric Assessment Unit (PAU)
 Expected duration of scenario: 15 mins Expected duration of debriefing: 30 mins

EQUIPMENT AND CONSUMABLES

- Mannequin (newborn)
- Monitoring
- Resuscitation trolley
- O₂ facemask
- Bag and mask
- IV cannula and sticker fixation
- 0.9% saline
- 0.45% saline + 5% dextrose
- Drug chart
- Obs chart
- SORT Emergency drug chart
 (if requested – see appendix)

PERSONNEL-IN-SCENARIO

- ST1-3 trainee *and/or* ST4-8 trainee
- Paediatric or ED nurse
- Parent of baby

FACULTY NOTES

This is a reasonably straightforward scenario with hypovolaemia secondary to vomiting pyloric stenosis. The aim is to see the interaction between the participants (medical and nursing) and the parent.

If a good history is taken from the baby's parent, the probable diagnosis will be clear before the blood gas is available. Blood gas should only be available once at least one fluid bolus given.

Unless the doctor participant is extremely junior, a human factors 'twist' should be implemented, where the nurse is more concerned about criticising the decision for the baby to be brought to PAU (rather than ED) than treating the baby.

PARTICIPANT BRIEFING

You have just come on for the evening shift and the nurse has asked you to see a baby brought to the Paediatric Assessment Unit – GP letter below.

Dr Flannigan, Dr Bedford & Dr Benson



*West Park Healthcare Centre
Oxford
OX4 6BD
Tel: 01865 729549*

Re: Kristian Adams
8 weeks old

Dear Doctor

Many thanks for agreeing to see this baby with vomiting. We have been seeing him at the surgery because his mother has been worried about vomiting since he was born. A colleague of mine prescribed gaviscon for reflux but there was minimal response to this. I added in ranitidine, but there does not appear to have been any improvement.

I know that urinary tract infections can sometimes present with vomiting, but we have no urine dipstix at the surgery, so I wondered if you could assess him for a UTI and treat as necessary.

Many thanks

Iain Flannigan

Dr I Flannigan
MRCGP

FACULTY BRIEFING**IN-SCENARIO PERSONNEL BRIEFING (PARENT)**

You are Kristian's parent. He is 8 weeks old, and you are worried about his ongoing vomiting. Since birth he has been a 'vomity baby' and you have been to see the GP on numerous occasions. He was prescribed Gaviscon which initially helped (but also made Kristian somewhat constipated) and more recently he has been giving Ranitidine in addition to the Gaviscon. However, this has made no difference and you think his vomiting is getting worse as he gets older. You are very worried about him today because he is sleeping more than usual and not feeding well. If asked, he has had fewer wet nappies than usual today.

Feeding: Kristian usually feeds well from the bottle, taking 3 ounces every 3 hours. However, he vomits large quantities soon after the feed and appears hungry again.

If asked, the vomiting is projectile in nature.

Birth: Kristin was born by normal vaginal delivery, one week early. He weighed 3.7kg at birth. There were no complications and mother and baby discharged from hospital together at 6 hours of age.

If asked: waters broke <30 min before delivery, no fevers in labour and you have never heard of GBS (Group B Strep).

Medications: Gaviscon and ranitidine (as above).

Family History: Kristian is your first baby. There is no significant family history.

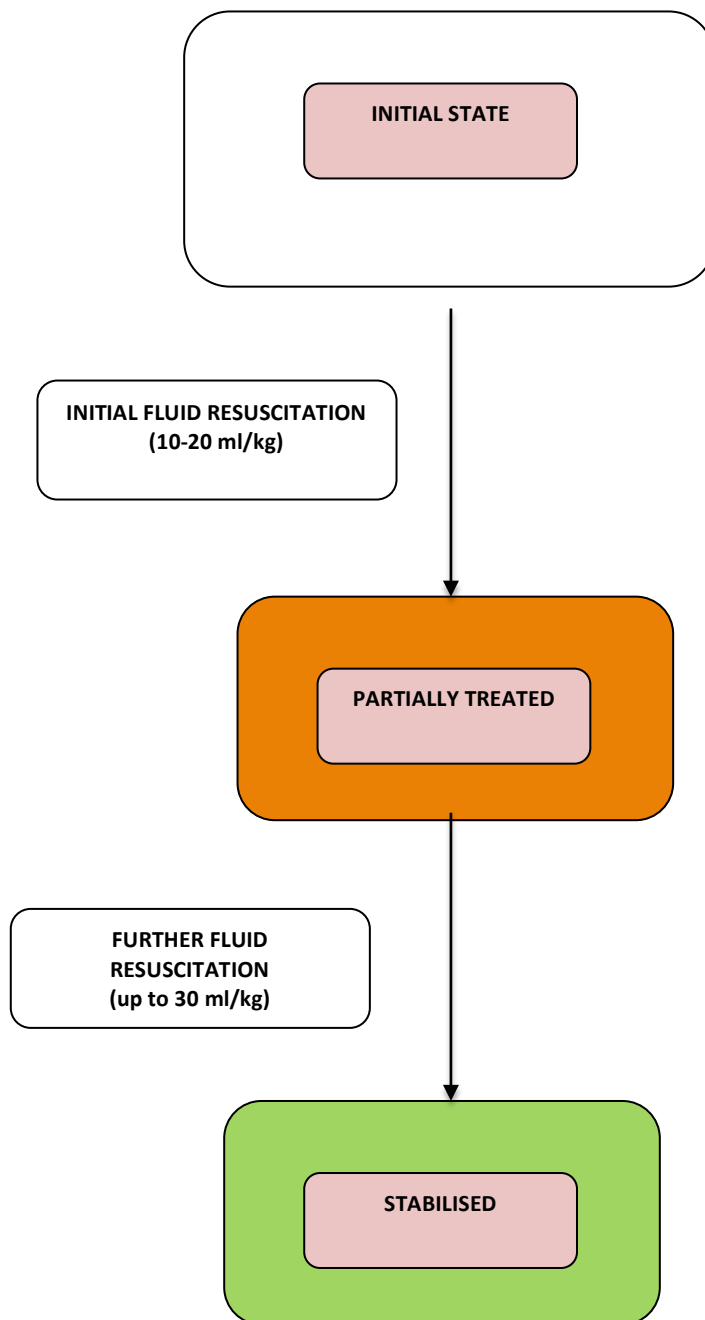
IN-SCENARIO PERSONNEL BRIEFING (NURSE – IF NO NURSES AS PARTICIPANTS)

You have assessed Kristian and are worried because he is listless and tachycardic. You have seen babies with sepsis present like this. You have therefore asked the doctor to review Kristian as a priority.

If experienced doctor, add a human factors challenge:

You are very annoyed that this baby has been brought to the PAU. He is clearly unwell and should have been advised to go to Emergency Department. You have lots of other patients to deal with, and PAU is not the right place to deal with babies as sick as Kristian. The last baby that turned up at PAU that looked this unwell ended up going to PICU with a diagnosis of sepsis, and there was criticism from senior managers about PAU management.

You are going to put an incident form in about the situation and you express this loudly to the doctor. Continue to express annoyance at situation; if doctor volunteers that they agree with you about incident form, you calm down and start focussing on baby's care.

CONDUCT OF SCENARIO

'Pause and Perfect' principle – to be used at any time during the scenario if lack of progress or significantly inappropriate management:

Pause scenario and review lack of patient improvement, discussing possible causes and solutions.
Then restart scenario and allow participant to manage patient.

INITIAL STATE

VITAL SIGNS					
Rhythm	SR	HR	190	BP	64/30 (41)
Resp rate	34/min	SaO ₂	98% in air	ETCO ₂	
Temp	36.1 °C	AVPU	A (Crying)	Pupils	ERL 3mm
Other	Wt = 4kg				
ASSESSMENT					
Pulses	Palpable	Cap refill	5 seconds	Skin	Turgor increased
Airway	Crying weakly	Breathing	Normal	Breath sounds	Bilateral vesicular
Work of breathing	Normal	Recession	Nil	Neuro	Slightly floppy
Other	If asked, looks thin/wasted		Heart sounds normal		
EXPECTED OUTCOMES					
Participants should:	<ol style="list-style-type: none"> 1. Introduce self to mother/father 2. Obtain history: feeding, growth, birth, risk factors for sepsis, family Hx 3. Assess baby and recognise likely hypovolaemia/dehydration (increased skin turgor, tachycardia, prolonged capillary refill) 4. Obtain IV access and take bloods including gas, FBC, U+E, cultures 5. Give 10-20 ml/kg fluid bolus 0.9% saline then reassess 6. May discuss obtaining clean catch urine/giving IVABx 				
Facilitators should:	<p><u>Provide further information if requested:</u></p> <ul style="list-style-type: none"> - Increased skin turgor, cap refill 5 seconds, floppy baby with weak cry - Wt = 4kg today. If asked, looks thin/wasted <p><u>Progression:</u></p> <ul style="list-style-type: none"> - After first boluses of fluid (10-20ml/kg) clinical state begins to improve <p>Progress to 'partially treated'</p>				

PARTIALLY TREATED

VITAL SIGNS					
Rhythm	SR	HR	160	BP	68/32 (43)
Resp rate	35/min	SaO₂	98% in air	ETCO₂	
Temp	36.1 °C	AVPU	A (Crying)	Pupils	ERL 3mm
Other	Wt = 4kg				
ASSESSMENT					
Pulses	Palpable	Cap refill	3-4 seconds	Skin	Turgor increased
Airway	Crying weakly	Breathing	Normal	Breath sounds	Bilateral vesicular
Work of breathing	Normal	Recession	Nil	Neuro	Still floppy
Other	If asked, looks thin/wasted		Heart sounds normal		
EXPECTED OUTCOMES					
Participants should:	<ol style="list-style-type: none"> 1. Recognise improving condition but still tachycardic with prolonged capillary refill time 2. Interpret blood gas result as hypochloraemic, hypokalaemic metabolic acidosis. Working diagnosis pyloric stenosis. 3. May discuss obtaining clean catch urine/giving IVABx 				
Facilitators should:	<p><u>Provide further information if requested:</u></p> <ul style="list-style-type: none"> - Increased skin turgor, cap refill 3-4 seconds, still somewhat floppy with weak cry - Wt = 4kg today. If asked, looks thin/wasted - Provide blood gas result at this stage <p><u>Progression:</u></p> <ul style="list-style-type: none"> - After total 30ml/kg fluid bolus, heartrate and capillary refill improve <p>Progress to 'stabilisation'</p>				

STABILISED

VITAL SIGNS					
Rhythm	SR	HR	140	BP	68/32 (43)
Resp rate	36/min	SaO₂	98% in air	ETCO₂	
Temp	36.3 °C	AVPU	A (Crying)	Pupils	ERL 3mm
Other	Wt = 4kg				
ASSESSMENT					
Pulses	Palpable	Cap refill	2 seconds	Skin	Turgor increased
Airway	Crying	Breathing	Normal	Breath sounds	Bilateral vesicular
Work of breathing	Normal	Recession	Nil	Neuro	Tone normalising
Other	If asked, looks thin/wasted		Heart sounds normal		
EXPECTED OUTCOMES					
Participants should:	1. Recognise successful fluid resuscitation 2. Discuss ongoing management: - Nil by mouth - NG tube if ongoing vomiting - IV fluids (with potassium added once urine output confirmed, as risk of pre-renal impairment). - Not unreasonable to give IVABx pending culture results as baby presented as significantly unwell requiring fluid boluses.				
Facilitators should:	Provide further information if requested: - Tone improved, capillary refill time 2 seconds <u>Progression:</u> - If time allows, participant could explain ongoing management to parent				

APPENDIX 2 – EMERGENCY DRUG CHART

Date Feb 28, 2013

<p>Southampton Oxford Retrieval Team</p>	<p style="text-align: center;">DRUG CALCULATOR</p> <p style="text-align: center;">WEIGHT 4 Kg</p> <p style="text-align: center;"><i>Enter weight and click calculate</i></p> <p style="text-align: center;"> Calculate Print </p>	
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Emergency		Respiratory	
Adrenaline 1:10,000	0.4 ml (0.1 ml/kg)	Magnesium Sulphate	160 mg (40 mg/kg over 20 minutes)
Atropine 600 mcg/ml	0.17 ml (20mcg/kg, min 100mcg)	Salbutamol load	60 mcg (15 mcg/kg over 10 minutes)
Atropine 100mcg/ml	1 ml (20mcg/kg min 100mcg)	Hydrocortisone	16 mg (4 mg/kg, max 100mg)
Sodium Bicarbonate 8.4%	4 ml (1 ml/kg)	Aminophylline load	20 mg (5 mg/kg over 20 minutes)
Calcium Gluconate 10%	2 ml (0.5 ml/kg)	Adrenaline 1:1000 Nebulised	2 ml (0.5 ml/kg, max 5 mls) Make up to 5 ml with saline
Cardiac		Anaesthesia	
Cardioversion (sync)	4 Joules (1J/kg) (use 2J/kg if fails)	Ketamine	8 mg (2mg/kg)
Shockable rhythm (async)	16 Joules (4J/kg)	Thiopentone	4 to 20 mg (1-5mg/kg)
Adenosine	400 mcg (100 mcg/kg)	Fentanyl	8 to 20 mcg (2-5mcg/kg)
Amlodarone Load	20 mg (5 mg/kg over 30 minutes to 4hrs)	Morphine	0.4 mg (0.1 mg/kg)
Neuro		Rocuronium	4 mg (1mg/kg)
Lorazepam	0.4 mg (0.1 mg/kg)	Atracurium	2 mg (0.5mg/kg)
Midazolam Buccal	0.4 mg (0.1 mg/kg)	Vecuronium	0.4 mg (0.1mg/kg)
Phenytoin	80 mg (20 mg/kg over 20 minutes)	Suxamethonium	6 mg (1.5mg/kg)
Phenobarbitone	80 mg (20 mg/kg)	Anaphylaxis	
Paraldehyde PR	1.6 ml (0.4 ml/kg, mix 1:1 with oil)	Adrenaline IM	0.15 ml of 1:1000
3% Saline	12 ml (3ml/kg)		
Mannitol 10%	20 ml (5ml/kg, eqivalent to 0.5g/kg)		

Infusions

Calculations based on Southampton PICU infusions guidelines (2011)

Dopamine (central)	60 mg In 50ml of 0.9% Saline or 5% Glucose	1 ml / hr =	5 mcg/kg/min
Dopamine (peripheral)	6 mg In 50ml of 0.9% Saline or 5% Glucose	1 ml / hr =	0.5 mcg/kg/min
Adrenaline	1.2 mg In 50ml of 0.9% Saline or 5% Glucose	1 ml / hr =	0.1 mcg/kg/min
Noradrenaline	1.2 mg In 50ml of 0.9% Saline or 5% Glucose	1 ml / hr =	0.1 mcg/kg/min
Milrinone	10 mg In 50ml of 0.9% Saline or 5% Glucose	0.6 ml / hr =	0.5 mcg/kg/min
Dinoprostone (Prostin E2)	50 mcg In 50ml of 0.9% Saline or 5% Glucose	1.2 ml / hr =	5 ng/kg/min
Morphine	4 mg In 50ml of 0.9% Saline or 5% Glucose	1 ml / hr =	20 mcg/kg/hr
Midazolam	4 mg In 50ml of 0.9% Saline or 5% Glucose	1 ml / hr =	20 mcg/kg/hr
Salbutamol	10 mg In 50ml of 0.9% Saline or 5% Glucose	1.2 ml / hr =	1 mcg/kg/min
Aminophylline	250 mg In 250ml of 0.9% Saline or 5% Glucose	4 ml / hr =	1 mg/kg/hr

DEBRIEFING**POINTS FOR FURTHER DISCUSSION**CLINICAL

Case history and blood gas results means that diagnosing pyloric stenosis is often easy. However, even without these 'clues' the initial management (fluid resuscitation) of a tachycardic, poorly perfused infant is the same, regardless of cause.

[Question: what is the one time you might want to refrain from aggressive fluid management in an infant with tachycardia and poor perfusion?]

[Answer: if suggestion of cardiac failure e.g. cardiac murmur with hepatomegaly]

Note that babies can have dual pathology e.g. reflux (causing vomiting from birth) and pyloric stenosis (causing crescendo of projectile vomiting symptoms at around 4-6 weeks of age).

COMMUNICATION (if nurse role obstructive)

How best to deal with nurse if concentrating on incident reporting rather than clinical care? It is unhelpful and unprofessional to continually criticise in front of parent, especially if it is at the expense of patient care.

Perhaps acknowledging the issue would help. Agree that an incident form should be completed (as it should!). Suggest that you help filling one out together after the patient is stabilised, but reinforce that emergency patient care comes first.

PYLORIC STENOSIS - HANDOUT**INFORMATION FOR PARTICIPANTS****KEY POINTS**

1. Pyloric stenosis presents with hypochloraemic, hypokalaemic metabolic alkalosis with a history of worsening projectile vomiting in a hungry baby
2. Fluid resuscitation may be needed in these babies; stabilisation prior to surgery is most important factor in overall mortality.

FURTHER RESOURCES

Great Ormond Street Hospital information page on pyloric stenosis with links to information for parents.

<http://www.gosh.nhs.uk/medical-conditions/search-for-medical-conditions/pyloric-stenosis/>

Summary article on pyloric stenosis. Somewhat radiology-heavy but thorough and detailed about all aspects of diagnosis and management.

<http://radiology.rsna.org/content/227/2/319.full>

RELEVANT AREAS OF THE CURRICULUM

Level One

L1_GEN_STA_02	Effective responses to challenge, complexity and stress in paediatrics
L1_GEN_STA_03	Advanced neonatal and paediatric life support skills
L1_GEN_STA_05	Effective skills in paediatric assessment
L1_GEN_STA_15	Knowledge of common and serious paediatric conditions and their management
L1_GEN_STA_29	Effective Communication and interpersonal skills with colleagues
PAED_L1_GAST_GEN_01	Have the knowledge and skills to be able to assess and initiate management of patients presenting with gastroenterological problems
PAED_L1_GAST_GEN_03	Recognise when a surgical opinion is required (gastro symptoms)
PAED_L1_GAST_ACU_D+V_01	Know the causes of the symptoms of acute diarrhoea and/or vomiting
PAED_L1_GAST_ACU_D+V_04	Recognise features in the presentation which suggest serious pathology e.g. haemolytic uraemic syndrome, appendicitis, intestinal obstruction

Level Two (as above plus):

L2_GEN_STA_02	Increasing credibility and independence in response to challenge and stress in paediatrics
L2_GEN_STA_03	Leadership skills in advanced neonatal and paediatric life support
L2_GEN_STA_15	Extended knowledge of common and serious paediatric conditions and their management
L2_GEN_STA_29	Skills in ensuring effective relationships between colleagues
L2_GEN_STA_32	Effective skills in ensuring handover, referral and discharge procedures in paediatrics
PAED_L2_GAST_ACU_ABNO_01	Institute appropriate emergency treatment and be able to assess the fitness of the baby and the need to transfer to a specialist centre (congenital abnormalities)
PAED_L2_GAST_ACU_ABNO_03	Recognise the need to liaise with surgeons and when this is urgent

Level Three (as above plus):

L3_GEN_STA_02	Responsibility for an effective response to complex challenges and stress in paediatrics
L3_GEN_STA_03	Effectives responses to life-threatening situations and to unpredictability in paediatric clinical situations
L3_GEN_STA_15	Detailed knowledge of common and serious paediatric conditions and their management in General Paediatrics or in a paediatric sub-specialty
L3_GEN_STA_34	Exemplary professional conduct so as to act as a role model to others in providing safe clinical care
L3_GEN_STA_35	Responsibility for ensuring their own reliability and accessibility and that of others in their team

PARTICIPANT REFLECTION

What have you learned from this experience? (Please try and list 3 things)

How will your practice now change?

What other actions will you now take to meet any identified learning needs?

PARTICIPANT FEEDBACK

Date of training session:.....
 ...

Profession and grade:.....

What role(s) did you play in the scenario? (Please tick)

Primary/Initial Participant	<input type="checkbox"/>
Secondary Participant (e.g. 'Call for Help' responder)	<input type="checkbox"/>
Other health care professional (e.g. nurse/ODP)	<input type="checkbox"/>
Other role (please specify):	<input type="checkbox"/>
Observer	<input type="checkbox"/>

	Strongly Agree	Agree	Neither agree nor disagree	Disagree	Strongly Disagree
I found this scenario useful					
I understand more about the scenario subject					
I have more confidence to deal with this scenario					
The material covered was relevant to me					



Please write down one thing you have learned today, and that you will use in your clinical practice.

How could this scenario be improved for future participants? This is especially important if you have ticked anything in the disagree/strongly disagree box.

FACULTY DEBRIEF – TO BE COMPLETED BY FACULTY TEAM

What went particularly well during this scenario?

What did not go well, or as well as planned?

Why didn't it go well?

How could the scenario be improved for future participants?