

Supplementary table S1: Focus group topic guide

1. What factors influence the decisions around AM [antimicrobial] prescribing on ICU [intensive care unit] in this Trust [i.e., institution]/hospital?

Prompts (if not mentioned spontaneously):

- How do the AM stewardship programmes in the Trust affect AM prescribing decisions? What are your thoughts on the AM stewardship programmes within the Trust?
 - What infrastructure is there to support AM prescribing on the ICU? *E.g. laboratory support, electronic prescribing*
 - How does experience and expertise of staff influence the AM prescribing decisions? *E.g. Intuitive versus analytical decision making, confidence in prescribing*
 - How does the organisational culture impact on AM prescribing decisions? *E.g. hierarchy, prescribing autonomy, transparency, general compliance with guidelines, general use of AM (culture of broad spectrum overuse?)*
 - How do individual patient factors which influence the AM prescribing decisions? *E.g. comorbidities, antibiotic history, allergies, provenience, severity of illness/risk of deterioration*
 - How does perceived patient risk affect AM prescribing? *E.g. risk of ineffective treatment, risk of AE [adverse events] and Interactions, distal versus proximal risk?*
 - What effect do local resistance patterns have on AM prescribing? How is this affected by the type of infection? *E.g. HAP or VAP*
 - How does the time of day/ day of week affect the decision making process?
 - How do interactions between different teams (ICU, micro[biology], ID [infectious diseases], specialist) affect AM prescribing decisions? *E.g. communication, collaboration, conflict resolution*
 - How do prescribing etiquette and hierarchy affect AM prescribing decisions? *E.g. feedback on colleagues prescribing? Pressure to comply with decisions? Level of seniority?*
2. Are there any factors that we haven't discussed today that you think affect AM prescribing decisions on ICU?

Supplementary table S2: Vignettes and interview guides

Scenario 1: A starting vignette (Adult)

Frieda is 55yo [years old] and was admitted to your ICU [intensive care unit] 10 days ago with acute, severe pancreatitis. She has suffered in the past from gall stones but apart from intermittent pain they caused her no other problems. However, 12 days ago she presented to the ED [emergency department] with very severe abdominal pain and a diagnosis of (necrotising) pancreatitis was confirmed by a CT [computerised tomography] scan and a markedly raised amylase. Following admission she deteriorated on the ward with increasing abdominal distension, progressive cardiovascular and respiratory deterioration. She required intubation and ventilation and, for 48 hours required noradrenaline. She was started on a course of meropenem and TPN [total parenteral nutrition] (intravenous food) via a central line at the time of intubation. Otherwise management was conservative.

10 days later and things are improving, she is no longer on vaso-actives, her abdomen is less distended and NG [nasogastric] aspirates are decreasing, though the surgeons still feel TPN is warranted. She remains intubated but is slowly weaning from the ventilator (FiO₂ [fraction of inspired oxygen] 0.45, PSV [pressure support ventilation] 15/7) she is slowly waking up as the sedation is reduced. The meropenem was stopped 3 days ago.

You are covering the ICU tonight and the nurse at the bedside reports she has a new temperature of 38.1C. The chart shows no other temperatures over the last 4 days. There was nothing unusual about her morning bloods (CRP [C-reactive protein]/WCC [white cell count], raised but stable etc.). She is also a bit more tachycardic, normally ~90bpm [beats per minute], now ~100bpm but blood pressure is maintained, urine output seems good and no change to her respiratory parameters or blood gas.

Her CVC [central venous catheter] looks clean, the abdomen is distended and appears tender on palpation (though no more than last night), and she has decreased air entry at both bases with occasional coarse crackles.

Scenario 1: A starting vignette (Paediatric)

Amber is an 11 month old admitted to your ICU with respiratory distress. She had been unwell for 48 hours with a mild temperature, cough and fast breathing. She was seen in A and E [Accident and Emergency] at her local hospital and referred to [Hospital name] for concerns about breathing. Her respiratory distress worsened and her oxygen Sats [saturation] started to decline following arrival on PICU [paediatric intensive care unit]. She had bilateral crackles and wheezes. An NPA [nasopharyngeal airway] from the referring hospital revealed RSV [respiratory syncytial virus]. The Intensivists felt she required intubation and ventilation. A CXR [chest X-ray] showed some patchy shadowing. She has a fever of 38.5 C. Her CRP [C-reactive protein] is 22.

Interview schedule for starting vignettes

1. What is going through your mind here?
2. Would you start antibiotics?
3. How comfortable are you with your decision?
4. If you are not 100% sure you are doing the right thing what information would you like (either existing tests or one from the future)?¹
5. If you had a device able to detect respiratory pathogens in 6 hours, would that change your approach (or levels of comfort)?
6. Does antimicrobial stewardship factor into your prescribing decisions? In what ways?

¹ An analysis of responses to questions 4 and 5 will be published in a separate manuscript.

Scenario 2: A stopping/de-escalating vignette (Adult)

You have just taken over the care of John. He is 73 years old and was admitted with a fractured neck of femur. He has a history of moderate COPD [chronic obstructive pulmonary disease] but continues to smoke 15-20 cigarettes/day. His symptoms are managed by his GP [general practitioner] using a combination of inhalers, allowing him to be independent; he has never been in hospital before. The fracture was successfully operated on the next day. John was slow to mobilise, and after three days he started to feel generally unwell, increasingly short of breath and developed a cough productive of yellow sputum. He was reviewed on the ward by the medical team, and started on appropriate antibiotics. However, he continued to worsen. When he was reviewed the next day, he was noted to be very tachypnoeic (35/minute) and hypoxic (PaO₂ [partial pressure of oxygen] 6.4kPa on FiO₂ [fraction of inspired oxygen] 0.6). He had a heart rate of 110 and a temperature of 37.9C. There were some crackles heard at his right lung base and a widespread, fine, expiratory wheeze. His white cell count was 12x10⁹/ml (neutrophilia) and his CRP [C-reactive protein] was 64mg/l (normal 0-5). A chest X-ray demonstrates clear consolidation/collapse of the right middle lobe. A diagnosis of hospital acquired pneumonia was made. He was transferred to the ICU [intensive care unit], where he was intubated and ventilated.

4 days later you take over his care on the ICU. He is slowly weaning from ventilation, he has had an occasional low grade pyrexia (37.7 max), his CRP is falling (22) and WCC [white cell count] remains slightly elevated at 13x10⁹/ml. An endotracheal aspirate was sent for culture soon after admission to the ICU but so far, no growth. Blood cultures, the atypical screen, Influenza A/B PCR [polymerase chain reaction] and pneumococcal ag [antigen test] also remain negative. No other concerns have been raised.

Scenario 2: A stopping/de-escalating vignette (Paediatric)

Peter, a 2-year old born prematurely at 24 weeks with chronic lung disease had been admitted to PICU [paediatric intensive care unit] on 4 occasions with respiratory distress. Now he is 2 years old and was admitted a week ago (In December) with respiratory distress. The CXR [chest X-ray] showed some increased shadowing but on a background of chronic lung disease. An NPA [nasopharyngeal airway] had revealed RSV [respiratory syncytial virus] and Influenza B when admitted. He was started on Piperacillin/Tazobactam and Amikacin for suspected secondary bacterial chest infection. Tracheal aspirates grew commensals. He started to improve and is due to be weaned from the ventilator over the next 24 hours. His CRP [C-reactive protein] is 29.

Interview schedule for stopping/de-escalating vignettes

1. What would you like to do with the antibiotics? Please explain your rationale.
(prompts if necessary)
 - Stop?
 - Continue until:
 - End of course?
 - CRP [C-reactive protein] and WCC [white cell count] normalised?
 - Patient is extubated?
2. How comfortable are you with this decision?
3. What further evidence would you like?
4. Does antimicrobial stewardship factor into your prescribing decisions? In what ways?

Supplementary table S3: Authors' disciplines

AMP is a research psychologist, with a specialisation in organisational and social psychology.

RH is a professor in behavioural medicine.

YJ is a consultant pharmacist with experience in qualitative research and interviewing.

TWR is an associate professor in organisational psychology.

NB has a background in clinical pharmacy and has experience in research in behavioural medicine, including qualitative research and interviewing.

DB is a consultant intensivist at one of the participating sites.

VIE is a senior research fellow in microbiology.

DML is a professor in medical microbiology.

VG is a consultant in microbiology and infection at two of the participating sites.

SJB is a professor of critical care medicine and a consultant intensivist at a non-participating hospital. Before data collection, he believed that interviewees would discuss their confidence about different sources of advice or information available.