Multidrug resistant organisms (Impact on discharge from Hospital)

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Overview

- Multidrug resistant organisms
  - Bacteria
  - Antibiotics
  - Antibiotic resistance

- Impact on discharge from hospital
  - Communication
Multidrug resistant organisms

- No standardised definition
- Practical definition used for bacteria: Resistant to 3 or more classes of antibiotics.
- Usually applies to organisms where the resistance is acquired rather than inherent
- Some bacteria are inherently resistant to many antibiotics. For example the Enterococci (faecal streptococci which all humans carry) are inherently resistant to many groups of antibiotics
Media profile

25 July 2007
“Superbugs”-Media

Antibiotic resistant organisms/Healthcare associated infections

- MRSA
- ESBL (Extended spectrum beta-lactamase) positive organisms
- *Clostridium difficile*
- Carbapenemase-Producing Enterobacteriaceae ‘CPE’
- Vancomycin-resistant enterococci (VRE)/Glycopeptide resistant enterococci
- Other multidrug resistant bacteria
What are antibiotics?

- In the strictest sense antibiotics are naturally-occurring compounds, produced by microorganisms.

For example:

penicillin and *Penicillium notatum*
Discovery of penicillin 1928

Alexander Fleming
Downloaded from Google images/Wiki

Downloaded from digital.nls.uk
Antibiotic/Antibacterial

- Now the word antibiotic is used to include synthetic compounds which are antibacterial such as ciprofloxacin

‘antibiotic=antibacterial’
Antibiotic resistance

- Antibiotic resistance is a naturally occurring phenomenon which enables bacteria to adapt to their environment and survive.
- Bacteria from the pre-antibiotic era are resistant to antibiotics.
Bacteria have a huge capacity for genetic variation

- Bacteria reproduce by binary fission
- *E. coli* can multiply every 20-30 mins under optimal conditions
- 1 *E. coli* can become millions in hours
Plasmids: mobile genetic elements in bacteria

**Plasmids** are circles of DNA outside the chromosome.
Bacteria can exchange plasmids with each other

Conjugation
Spread of antibiotic resistance among bacteria

- Transfer of resistance genes by bacteria happens in nature
- Occurs between bacteria of different species.
- Is a survival strategy for bacteria
Antibiotic miracle
Timeline of antibiotic resistance and antibiotic development (CDC)
We are running out of antibiotics

<table>
<thead>
<tr>
<th>Antibiotic Resistance Identified</th>
<th>Antibiotic Introduced</th>
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<tbody>
<tr>
<td>gentamicin-R Enterococcus</td>
<td>1979</td>
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<tr>
<td>cefazidime-R Enterobacteriaceae</td>
<td>1987</td>
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<tr>
<td>vancomycin-R Enterococcus</td>
<td>1988</td>
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<td>levofloxacin-R Pneumococcus</td>
<td>1996</td>
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<tr>
<td>imipenem-R Enterobacteriaceae</td>
<td>1998</td>
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<tr>
<td>XDR tuberculosiandlinezolid-R Staphylococcus</td>
<td>2000</td>
</tr>
<tr>
<td>vancomycin-R Staphylococcus</td>
<td>2001</td>
</tr>
<tr>
<td>PDR- Acinetobacter and Pseudomonas</td>
<td>2002/5</td>
</tr>
<tr>
<td>ceftriaxone-R Neisseria gonorrhoeae</td>
<td>2009</td>
</tr>
<tr>
<td>PDR-Enterobacteriaceae</td>
<td>2010</td>
</tr>
<tr>
<td>ceftriaxone-R Staphylococcus</td>
<td>2011</td>
</tr>
</tbody>
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Antibiotic resistant organisms are in the food chain.

**UK supermarkets 'contributing to antibiotics crisis'**

Drug-resistant infections could kill 50 million people worldwide by 2050

Most of Britain’s leading supermarket chains have failed to reduce the amount of antibiotics given to animals on their farms, despite the potential risk to human lives, according to a new report.
Why are there no new antibiotics?

- Pharmaceutical companies are not developing new antibiotics
- Little financial incentive to develop drugs which are taken for a short period of time versus those which are taken for life
UK Five Year Antimicrobial Resistance Strategy
2013 to 2018
Concern about antibiotic resistance is not new...

*Science and Technology Committee Reports*
*House of Lords Select Committee inquiry*
*Antibiotic Resistance*

*House of Lords Session*
*1997-1998*
Infection Prevention and Control

- In the absence of new antibiotics, strict adherence to infection prevention and control precautions is key to prevent the spread of antibiotic resistance
MDR Organisms and impact on discharge

- The presence of MDR organisms should not restrict the care a patient requires.

- The presence of MDR organisms will affect:
  - The choice of antimicrobials to treat infection
  - Infection Prevention and Control procedures in healthcare, such as single room isolation in hospital

- Provided the patient is medically fit for discharge MDR organisms should not delay a patient’s discharge whether it is to home, residential or nursing home
Colonisation versus infection

- Colonisation is the presence of bacteria without signs or symptoms of infection (also referred to as ‘carriage’)
- The human body is colonised with huge numbers of bacteria
  
  These are termed normal flora
  
  In the large bowel bacteria outnumber human cells by 1:10

Normal flora are protective
Antibiotic resistance is not the same as virulence

- The relationship between antibiotic resistance and the ability of the organism to cause an infection (virulence) is not straightforward.

- MDR organisms are not more likely to cause an infection than a sensitive strain, but infections caused by MDR organisms are more difficult to treat because of the lack of therapeutic choice.
MDR organisms can be part of normal flora and live harmlessly in the body

- MRSA
- ESBL (Extended spectrum beta-lactamase) positive organisms- For example, *E. coli, Klebsiella, Proteus, Enterobacter*
- Carbapenemase-Producing Enterobacteriaceae ‘CPE’
- Vancomycin-resistant enterococci (VRE)/Glycopeptide resistant enterococci (GRE)
- Other multidrug resistant bacteria
Discharge from hospital—Effective communication

- Prompt, effective communication between healthcare providers is key to facilitate discharge of medically fit patients colonised with MDR organisms.
Patients and carers need accurate information about MDR organisms

- Patient leaflets for MDR organisms
- Effective communication from healthcare workers
Summary

- The presence of MDR organisms in a patient who is fit for discharge should not delay discharge from hospital.
- Effective communication between healthcare providers, patients and carers is key.
- Adherence to basic infection prevention and control procedures is essential to prevent the spread of MDR organisms in healthcare.

*Microorganisms cannot walk, jump or run, they must hitchhike from one place to another* (Caddow 1989)