Antimicrobial stewardship in long term care facilities

ECCMID

May 2014

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Conflicts of interest

- Participated in commercial advisory boards for: Astellas, Janssen, Novartis, Pfizer, Wyeth, Durata
- Received lecture funds from: Astellas, Bayer, Novartis, Pfizer, Wyeth
- Received research funds from: Bayer, Pfizer, Basilea
- Non-commercial positions as:
  - Chair of Scottish Antimicrobial Prescribing Group [SAPG] – Scottish Government Stewardship Programme
  - President ESGAP
  - President Elect BSAC
  - Ex-Chair of BSAC National OPAT working party
Long-term care (WHO/MMF, 2000)

“The system of activities undertaken by informal caregivers (family, friends and/or neighbours) and/or professionals (health and social services) to ensure that a person who is not fully capable of self-care can maintain the highest possible quality of life, according to his or her individual preferences, with the greatest possible degree of independence, autonomy, participation, personal fulfilment and human dignity”
Diversity of services to meet diversity of clients’ needs
TYPICAL LONG TERM CARE FACILITY IN SCOTLAND
TYPICAL NURSING HOME UK RESIDENT

Help the Aged

© by author
Patient flow among regional health care facilities.


© 2009 by the Infectious Diseases Society of America
27,000 nursing home residents have antibiotic-resistant infections

2 out of 3 nursing home residents receive at least one course of antibiotics annually

250,000 nursing home residents have infections

1.6 million people live in nursing homes
What is Antimicrobial Stewardship?

• An activity that optimises antimicrobial management and includes selection, dosing, route and duration of antimicrobial therapy and prophylaxis
• Also include clinical infection management and improving clinical outcomes
• Selection of antimicrobials from each class of drugs that does the least collateral damage e.g MRSA, ESBLs, C.difficile and does not cause unintended harm [more complications, toxicity]
• Appropriate de-escalation when culture results are available
• Marriage of infection control and infection management -”team working” with shared goals
• Need for clinical and organisational leadership & measurement of change
• Effective communication

ANTIMICROBIAL STEWARDSHIP:
GUIDANCE
High Rates of Multidrug-Resistant Organisms in Long-Term Care

• Frequent transfer from acute care hospitals
• Horizontal transmission of resistant organisms
• Widespread (often inappropriate) use of antimicrobials
Resistant Organisms are Common in Long-Term Care Facilities

### Table 2. Frequency of Culture Positivity on the Initial Study Swab for All Participants, by Study Organism

<table>
<thead>
<tr>
<th>Organism</th>
<th>RG n/N (%)</th>
<th>IP n/N (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MRSA</td>
<td>26/123 (21)</td>
<td>29/136 (21)</td>
</tr>
<tr>
<td>ESBL-producing <em>Klebsiella</em></td>
<td>19/114 (17)</td>
<td>16/117 (14)</td>
</tr>
<tr>
<td>pneumonieae</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ESBL-producing <em>Escherichia coli</em></td>
<td>29/114 (25)</td>
<td>14/117 (12)</td>
</tr>
<tr>
<td>Vancomycin-resistant enterococci</td>
<td>22/114 (19)</td>
<td>16/117 (14)</td>
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</table>
## Antibiotic Pressure from Hospital

<table>
<thead>
<tr>
<th>Variable</th>
<th>Relative Risk (95% Confidence Interval)</th>
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<tbody>
<tr>
<td>Methicillin-resistant <em>Staphylococcus aureus</em></td>
<td></td>
</tr>
<tr>
<td>Levofloxacin receipt*</td>
<td>1.6 (1.1–2.2)</td>
</tr>
<tr>
<td>Third-generation cephalosporin receipt*</td>
<td>2.0 (1.0–4.0)</td>
</tr>
<tr>
<td>Vancomycin-resistant enterococci</td>
<td></td>
</tr>
<tr>
<td>Transfer to or from another OFH unit*</td>
<td>1.2 (1.1–1.4)</td>
</tr>
<tr>
<td>Levofloxacin*</td>
<td>1.2 (1.0–1.5)</td>
</tr>
<tr>
<td>ESBL-producing <em>Klebsiella pneumoniae</em></td>
<td></td>
</tr>
<tr>
<td>Gastrostomy tube</td>
<td>1.2 (1.0–1.4)</td>
</tr>
<tr>
<td>ESBL-producing <em>Escherichia coli</em></td>
<td></td>
</tr>
<tr>
<td>Total dependence for activities of daily living</td>
<td>1.2 (1.0–1.3)</td>
</tr>
<tr>
<td>Levofloxacin receipt*</td>
<td>1.2 (1.0–1.4)</td>
</tr>
<tr>
<td>Third-generation cephalosporin*</td>
<td>1.4 (0.9–2.2)</td>
</tr>
</tbody>
</table>
Horizontal Transmission

- LTCF today can promote antimicrobial resistant infections and transmission to other high-risk patients
  - Invasive devices and procedures increased
    - Central lines, chronic resp therapy, feeding tubes, dialysis, IV antibiotics
  - Population includes more acute and subacute patients treated previously in hospitals
    - Staff not given appropriate education
  - Changing infection control provider without expertise

Crude prevalence of residents with HAI (/100 ER)

0 - 0.99
1 - 2.99
3 - 4.99
5 - 6.99
>7

According to modified McGeer criteria

Crude prevalence: 2.40%
Mean prevalence: 2.55%
[Md: 1.53%, 95% CI 2.43 – 2.67%]
HAI in care homes

- A total of 4870 residents from 83 care homes across Scotland were surveyed.
- The results indicate that within the surveyed care homes 2.6% (95% CI 2.2-3.1) of residents had an HAI at the time of survey. *(NB summer survey)*
- The prevalence of HAI by care home ranged from 0% to 13.5%.
- The prevalence of antimicrobial use was 7.3% (95% CI 6.6-8.1) and ranged from 0% to 27.8% by care home.
- Reservoir for hospital infections

Antimicrobial Use in Long-Term Care

• Antimicrobials prescribed frequently
  – 40% of all systemic drugs
  – 8% point prevalence
  – 50-70% likelihood resident will receive at least one course of systemic antimicrobials during one year period
  – Contributes to high costs

Zimmer JG et al., J Am Geriatr Soc 1986;34:703-710

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ANTIMICROBIAL USE

Crude prevalence: 4.3%
Mean prevalence: 4.9%
[Md: 3.4%, 95% CI 4.8% - 5.1%]
Antibiotic use and resistance in LTCF’s
van Buul LW et al JAMDA 2012

– Systematic review: nursing homes and residential care facilities

– Incidence/Prevalence of Antibiotic Use: prevalence rates from 47-79%; antibiotics prescribed for 77-88% of all infectious episodes

– Commonest infections: UTI, RTI, SSTI; UTI accounted for 32-66% of prescriptions in nursing home; RTI 15-35%; SSTI 13-18%

– Factors associated with antibiotic use:
  • Resident: use of invasive devices, requirement for extensive/complex rehabilitation
  • Facility: nursing home > residential home
  • Geography: variation within and between countries
Antimicrobial prescribing in European nursing homes

Pamela McClean, Carmel Hughes, Michael Tunney, Herman Goossens and Beatrice Jans on behalf of the European Surveillance of Antimicrobial Consumption (ESAC) Nursing Home Project Group

Figure 2. Patterns of prescribing of antimicrobials for systemic use (J01 class) in the selected sample of European nursing homes according to country DDDs/1000 residents/day in April 2009.
Antibiotic use and resistance in LTCF’s
van Buul LW et al JAMDA 2012

– Systematic review: nursing homes and residential care facilities
– Appropriateness of antibiotic use: 49-62%; worst prescribing is for UTI
– Review includes adverse events, CDI, resistance
– Impact on infection with resistant organisms on outcomes: increased mortality, worsening of quality of life
– The need for antibiotic stewardship
  • Current resources
  • Evidence of effectiveness of stewardship programmes
Antimicrobial Stewardship Programs

• Despite evidence of benefit, not all health care facilities have introduced such programs
  – 79% of university hospitals
  – 40% of community hospitals
  – Almost unheard of in long-term care facilities

• Lack of funding and personnel are the most commonly reported barriers

Johannsson B. Infect Control Hosp Epidemiol 2011;32:367-74
ASP in LTCF

- Survey of 230 LTCF in Nebraska
  - 37 facilities (16.1%) completed the survey
- ASP defined as “person or group of persons involved in monitoring antibiotic use or implementing programs to ensure appropriate use”

Van Schooneveld T. Infect Control Hosp Epidemiol 2011;32(7):732-4

<table>
<thead>
<tr>
<th>Facility characteristic</th>
<th>No. (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Formal ASP</strong></td>
<td>22 (59.5)</td>
</tr>
<tr>
<td><strong>Personnel involved in ASP</strong></td>
<td></td>
</tr>
<tr>
<td>Infection control professional</td>
<td>15 (68.2)</td>
</tr>
<tr>
<td>Nurse or director of nursing</td>
<td>7 (31.8)</td>
</tr>
<tr>
<td>Medical director</td>
<td>6 (27.3)</td>
</tr>
<tr>
<td>Pharmacist</td>
<td>5 (22.7)</td>
</tr>
<tr>
<td><strong>Monitoring of resistant pathogens</strong></td>
<td></td>
</tr>
<tr>
<td>MRSA</td>
<td>36 (97.3)</td>
</tr>
<tr>
<td>VRE</td>
<td>27 (73.0)</td>
</tr>
<tr>
<td><em>Clostridium difficile</em></td>
<td>32 (86.5)</td>
</tr>
<tr>
<td>MDR gram-negative bacteria</td>
<td>18 (48.6)</td>
</tr>
<tr>
<td><strong>Antimicrobial stewardship practices</strong></td>
<td></td>
</tr>
<tr>
<td>Antimicrobial formulary</td>
<td>7 (19.4)</td>
</tr>
<tr>
<td>Antibiogram available</td>
<td>28 (76.0)</td>
</tr>
<tr>
<td>Measure antibiotic use</td>
<td>30 (81.1)</td>
</tr>
<tr>
<td>Monitor individual prescribers</td>
<td>4 (10.8)</td>
</tr>
<tr>
<td>Monitor antibiotic costs</td>
<td>12 (32.4)</td>
</tr>
<tr>
<td>Restrict antibiotic use/antibiotic protocols</td>
<td>10 (27.0)</td>
</tr>
<tr>
<td>Assess antibiotic appropriateness</td>
<td>20 (54.1)</td>
</tr>
<tr>
<td>Provide education about appropriate use</td>
<td>21 (56.8)</td>
</tr>
<tr>
<td>Education directed to prescribers</td>
<td>3 (8.1)</td>
</tr>
<tr>
<td>Require preapproval of certain antibiotics</td>
<td>4 (10.8)</td>
</tr>
<tr>
<td>Target specific pathogens or syndromes</td>
<td>5 (13.5)</td>
</tr>
<tr>
<td><strong>Perceptions</strong></td>
<td></td>
</tr>
<tr>
<td>Believe antibiotics are overused in facility</td>
<td>20 (54.1)</td>
</tr>
<tr>
<td>Believe ASP would be beneficial in facility</td>
<td>33 (89.2)</td>
</tr>
<tr>
<td><strong>Perceived barriers to ASP (n = 26)</strong></td>
<td></td>
</tr>
<tr>
<td>Communication issues</td>
<td>2 (7.7)</td>
</tr>
<tr>
<td>System issues</td>
<td>2 (7.7)</td>
</tr>
<tr>
<td>Patient/family expectations</td>
<td>4 (15.4)</td>
</tr>
<tr>
<td>Physician practice/compliance</td>
<td>18 (69.2)</td>
</tr>
</tbody>
</table>

**NOTE.** ASP, antimicrobial stewardship program; MDR, multidrug resistant; MRSA, methicillin-resistant *Staphylococcus aureus*; VRE, vancomycin-resistant enterococci.
Fig 2  Summary of antimicrobial stewardship activities in 69 Irish long-term care facilities (LTCFs). *Permission required for prescribing restricted antimicrobials.

Sheila Donlon, Fiona Roche, Helen Byrne, Siobhan Dowling, Meaghan Cotter, Fidelma Fitzpatrick

A national survey of infection control and antimicrobial stewardship structures in Irish long-term care facilities

American Journal of Infection Control, Volume 41, Issue 6, 2013, 554 - 557

http://dx.doi.org/10.1016/j.ajic.2012.06.010
PARTICIPATING COUNTRIES

28 countries, 722 LTCFs

- Austria
- Belgium
- Bulgaria
- Croatia
- Cyprus
- Czech Republic
- Denmark
- Estonia
- Finland
- France
- Germany
- Greece
- Hungary
- Ireland
- Italy
- Lithuania
- Luxemburg
- Malta
- Poland
- Portugal
- Slovenia
- Spain
- Sweden
- The Netherlands
- UK: England
  - Scotland
  - Wales
  - Northern Ireland

Total LTCF-beds: 67,613 beds
Mean LTCF size: 94 beds (9 – 695 beds)
Total eligible population: 63,884 r. (94.5%)
Table 8: Overview of the available antibiotic stewardship resources in the participating nursing homes

<table>
<thead>
<tr>
<th>Antibiotic committee</th>
<th>Regular training of prescribers</th>
<th>Written guidelines for appropriate AB use</th>
<th>Data available on annual AB consumption</th>
<th>Microbiological samples taken for guidance AB choice</th>
<th>Drug resistance profiles in the NH</th>
<th>Mandatory use of a motivation form outside formulary</th>
<th>pharmacist advice on AB prescribing/choice</th>
<th>NH therapeutic formulary + chapter on AB therapy</th>
<th>Respiratory tract infections</th>
<th>Urinary tract infections</th>
<th>Wound and soft tissue infections</th>
<th>Surveillance of antimicrobial use + feedback</th>
<th>Surveillance of resistant organisms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bulgaria</td>
<td>0/1</td>
<td>0/1</td>
<td>0/1</td>
<td>1/1</td>
<td>0/1</td>
<td>0/1</td>
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<td>0/1</td>
<td>1/1</td>
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<td>0/1</td>
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<td>4/4</td>
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<td>2/8</td>
<td>8/8</td>
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<td>3/8</td>
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<td>7/8</td>
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<td>France</td>
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<td>Hungary</td>
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<td>Lithuania</td>
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<td>52/62</td>
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<tr>
<td></td>
<td>15.8%</td>
<td>22.1%</td>
<td>45.3%</td>
<td>32.6%</td>
<td>71.6%</td>
<td>16.8%</td>
<td>23.2%</td>
<td>18.9%</td>
<td>56.8%</td>
<td>88.7%</td>
<td>83.9%</td>
<td>75.8%</td>
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n.a. = data not available
Figure 8: Overall frequencies of the reported tasks of the coordinating physician (n=94)
Figure 10: Overall frequencies of the available antibiotic stewardship elements in the participating nursing homes (n=95)
Presence of National Curriculum or Programme for training IC/HH Nurses

(IPSE 2006)

54.8% (17/31)

(TRICE 2010)

63.6% (21/33)
THE LTCF STEWARDSHIP TOOL KIT: WHAT EVIDENCE

Antibiotic use in nursing homes

Did you know?
1. Antibiotic resistance is one of the world’s most pressing public health threats.
2. Antibiotics are the most important tool we have to combat life-threatening bacterial diseases, but antibiotics can have side effects.
3. Antibiotic overuse increases the development of drug-resistant germs.
4. Patients, clinicians, healthcare facility administrators, and policy makers must work together to employ effective strategies for improving antibiotic use – ultimately improving medical care and saving lives.

Scope of the problem in nursing homes
- Antibiotics are among the most commonly prescribed medications in nursing homes.
- Up to 70% of long-term care facilities’ residents receive an antibiotic every year.
- Estimates of the cost of antibiotics in the long-term care setting range from $38 million to $137 million per year.
- Among the antibiotic-resistant organisms most commonly found in nursing home populations are multidrug-resistant Gram-negative bacteria, methicillin-resistant Staphylococcus aureus (MRSA), and vancomycin-resistant enterococci (VRE).

Why focus on nursing homes?
- Many long-term care residents can be “colonized” with bacteria, meaning that germs can live on the skin, wound surfaces or even in the bladder without making the person sick. Challenges with separating colonization from true infection can contribute to antibiotic overuse in this setting.
  - Studies have consistently shown that about 30%-50% of frail, elderly long-term care residents can have a positive urine culture even without any symptoms of a urinary tract infection. Unfortunately, many of these patients are placed inappropriately on antibiotics.
- Poor communication when patients transfer facilities, for example from a nursing home to a hospital, can result in antibiotic misuse.
- Antibiotic-related complications, such as diarrhea from C. difficile, can be more severe, difficult to treat, and lead to more hospitalizations and deaths among people over 65 years. Long-term care facility residents are particularly at risk for these complications.
Antimicrobial Stewardship in LTCF’s: what is effective?
Nicolle LE. ARIC 2014, 3: 6

• 4 studies comprehensive programmes for LTCF’s;
  3 North America, one Sweden
• 2 cluster RCT’s, 2 before and after in single facility [no control, no time series]
• Range of interventions:
  – Guidelines +/- algorithms with/without interactive educational sessions, use of local audit data, booklets
  – ID consultation service [ID + nurse practitioner]
  – Some feedback
Antimicrobial Stewardship in LTCF’s: what is effective?
Nicolle LE. ARIC 2014, 3: 6

- Outcomes:

- Process:
  better compliance/adherence with guidance, especially empiric therapy
  reduced total antibiotic use, reduced IV, less FQ’s for UTI

Outcome: one study decreased CDI through a time series analysis

Durability of impact: 15-18 months in 2 studies
Effective Antimicrobial Stewardship in a Long-Term Care Facility through an Infectious Disease Consultation Service: tibiotic Use

Figure 1. Observed rates of antibiotic use before and after initiation of the long-term care facility (LTCF) infectious diseases consultation service (IDS) shown as filled and open symbols, respectively in the LTCF (A) and the hospital (B). The corresponding lines and their slopes (indicated on the graph) represent the estimated rate of change in antimicrobial use for total antimicrobials (squares), oral agents (stars), and intravenous agents (circles), determined using segmented regression analysis of interrupted time series. An asterisk indicates P ≤ .05.

Figure 2. Observed rates of positive Clostridium difficile tests at the long-term care facility (LTCF; squares) and the hospital (triangles) before (filled symbols) and after (open symbols) initiation of the LTCF infectious diseases consultation service (IDS). The corresponding lines and their slopes (indicated on the graph) represent the estimated rates of change for positive C. difficile tests at the LTCF (solid lines) and the hospital (dashed lines), determined using segmented regression analysis of interrupted time series. An asterisk indicates P ≤ .05.
Antimicrobial Stewardship in LTCF’s: what is effective?
Nicolle LE. ARIC 2014, 3: 6

• 5 studies for stewardship aimed at single infection LTCF’s; 4 North America, one Finland [primary care hospital, therefore ? LTCF
• 1 cluster RCT’s, 1 CRCT, 1 non-randomise, 2 before and after [no control, no time series]
• Range of interventions:
  – Guidelines +/- algorithms with/without interactive educational sessions, use of local audit data, booklets; use of videos, multi-disciplinary
  – Follow up, feedback,
  – ID consultation service [ID + nurse practitioner]
  – Some feedback
Antimicrobial Stewardship in LTCF’s: what is effective?
Nicolle LE. ARIC 2014, 3: 6

• Outcomes:
  Process:
  better compliance/adherence with guidance, especially empiric therapy
  antibiotics within 4 hours better,
  reduced total antibiotic use,
  UTI: focus – less antibiotics, less inappropriate culture, less antibiotic prophylaxis for UTI
  Outcome: one study no change in 30 day mortality or hospitalisation

Durability of impact: one study reduction in total use maintained for 7-30 months while study continued
Decision aid for diagnosis and management of suspected urinary tract infection (UTI) in older people

This flowchart has been designed to help nursing and care staff and prescribers manage patients/residents with urinary tract infection. If a patient/resident has a fever (defined as temperature > 37.9°C or 1.5°C increase above baseline occurring on at least 2 occasions in last 12 hours) this suggests they have an infection. Hypothermia (low temperature of <36°C) may also indicate infection, especially in those with co-morbidities (heart or lung disease, diabetes). Some patients/residents may also have non-specific symptoms of infection such as abdominal pain, alteration of behaviour, delirium (confusion) or loss of diabetes control. The information overleaf provides good practice points and evidence sources for prescribers.

Contact medical/clinical staff to request review of patient/resident

Take appropriate specimens and manage following local antibiotic policy

Are there any symptoms suggestive of non-urinary infection?
- Respiratory – shortness of breath, cough or sputum (phlegm) production, new pleuritic chest pain
- Gastrointestinal – nausea, vomiting, new abdominal pain, new onset diarrhoea
- Skin/soft tissue – new redness, warmth, swelling, purulent drainage (pus)

Does the patient/resident have a urinary catheter?

Does patient/resident have one or more of following signs or symptoms?
- shaking chills (rigors)
- new costovertebral (central low back) tenderness
- new onset or worsening of pre-existing delirium (confusion) or agitation

Does patient/resident have two or more of following signs or symptoms?
- dysuria (pain on urination)
- urgent need to urinate
- frequent need to urinate
- new or worsening urinary incontinence
- shaking chills (rigors)
- pain in flank (side of body) or suprapubic (above pubic bone)
- frank haematuria (visible blood in urine)
- new onset or worsening of pre-existing delirium (confusion) or agitation

UTI unlikely but continue to monitor symptoms for 72 hours

Ongoing fever and development of one or more of above symptoms?

UTI likely

Ongoing fever and development of two or more of above symptoms?

Contact medical/clinical staff to request review of patient/resident

- Assess if retention or sub-acute retention of urine is likely – blocked catheter or distended bladder
- DO NOT use dipstick test in diagnosis of UTI in older people
- Obtain a sample for urine culture and send to Microbiology
- Start antibiotic therapy following local policy or as advised by Microbiology
- If patient has a urinary catheter, remove and replace it. Consider the ongoing need for a long term catheter in consultation with specialists
- Consider use of analgesia (paracetamol or ibuprofen) to relieve pain
- Consider admission to hospital if patient has fever with chills or new onset hypotension (low blood pressure)
- Review response to treatment daily and if no improvement of symptoms or deterioration, consider admission to hospital or an increased level of care
- Ensure urine culture results are reviewed when available in order to streamline antibiotic therapy

May 2013 Review date: May 2014
Conclusions from evidence to support effectiveness

- Very small number of comprehensive or single intervention studies; simultaneous multiple interventions and non-standardised interventions across programmes
- Range of interventions and resourcing of programme
- No ITS, no controlled B&A study- cluster RCT design preferred by 3, one RCT
- All North America or Scandinavia
- Mainly improved process outcome; one study on CDI, one on 30d mortality, none on resistance, relapse/readmission, none on other adverse events or unintended consequences
- No data on cost – effectiveness
Nursing homes understanding workflow and culture

• Huge prevalence Abx use
  – 9% on antibiotics at any time
  – 40% don’t objectively have infection
    • Stuart et al Med J Aust 2013

• Qualitative research
  – Care attendant/nurse initiates call to doctor
  – Prescription starts over the phone, often locum
  – Specimens difficult to obtain
  – Delay to clinical review by doctor
  – Perception that frailty means ‘stronger antibiotic’ needed
    • Lim et al (In progress) 2014

Courtesy of K. BUISING 2014
Antimicrobial stewardship approaches for LTCF’s

- Understand the care and healthcare delivery systems for these facilities
- Identify and get agreement/buy-in of governance/regulatory authorities: identify AS as a quality of care & safety issue
- Identify champion/leader for LTCF; support from local acute care facility
- Develop local guidance; consider surveillance, Multi-disciplinary team: nurse/infection control practitioner key role
- Support with visits/feedback
- Consider one area where there is evidence of variation or harm to improve —'low hanging fruit, quick win’ e.g. UTI
- Consider measurement through a quality indicator/s; feedback of data
- Support with education/observerships-secondments for staff: consider some mandatory training—allign and combine with infection control where possible
Recommendations

• Identify through evidence core effective interventions in LTCF’s
• Need to do better designed studies that comply with EPOC criteria
• Measure outcomes and process and include unintended consequences [balancing measures]
• Measure cost-effectiveness
• Develop early guidance of structures, resources, organisation required for ASP’s in LTCF’S
• Allow flexibility and local customization
• Suggest develop INNOVATIVE models of stewardship that creatively uses existing skills/resources and range of implementation strategies collaboration
It is challenging to change physicians’ antimicrobial prescribing behaviour. Although antimicrobial prescribing is determined by contextual (e.g. a lack of guidelines), cultural (e.g. peer practice) and behavioural (e.g. perceived decision making autonomy) factors, most antimicrobial stewardship programmes fail to consider these factors in their approach. This may lead to suboptimal intervention effectiveness. We present a new approach in antimicrobial stewardship programme development that addresses relevant determinants of antimicrobial prescribing: participatory action research (PAR). PAR is a collaborative process that aims to bring about change in social situations by producing practical knowledge that is useful in local practice. It requires substantial involvement of relevant stakeholders to address determinants of the studied behaviour and to facilitate empowerment. PAR is well suited for complex problems in multidisciplinary settings as it adapts to local needs, delivering a tailored approach to improving local practice. We describe how PAR can be applied to antimicrobial stewardship, and describe the PAR design of two ongoing multicentre antimicrobial stewardship projects, in the acute care setting and the long-term care setting, respectively.
Visualization of the PAR design for the development, implementation and evaluation of antimicrobial stewardship programmes.


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