ESGAP/GERMAN SOCIETY OF INFECTIOUS DISEASES
Evidence to support effectiveness of educational interventions
Antimicrobial Stewardship: The Tools

Education
Guidelines and clinical pathways
Antimicrobial cycling
Antimicrobial order forms
Combination therapies
De-escalation
Dose optimisation
Parenteral to oral conversion

Dellit et al. Clinical Infectious Diseases 2007; 44:159-77
What Type of Intervention?

Davey et al Cochrane review EID 2006 & Cochrane Library 2009

- Structural
- Healthcare system (restrictive)
- Reminders
- Audit and feedback
- Patient-mediated interventions
- Local opinion leaders
- Educational outreach visits
- Educational meetings
- Distribution of educational materials

Distribution:
- Ambulatory (n=40)
- Hospital (n=106)
Meta-analyses

Interrupted time series

Pooled effect size for 51 studies

Purely persuasive [includes education] vs restrictive interventions

  22 purely persuasive
  29 restrictive
    15 purely restrictive
    14 with one or more persuasive components

Clinical outcomes
Longevity of Value of Interventions
Mean and 95% CI; Restrictive – Persuasive [Cochrane review update 2011]
## Systematic Review of Clinical Education Interventions: SHEA policy Report 2011

http://www.shea-online.org/Portals/0/Policy_Brief_11.pdf

<table>
<thead>
<tr>
<th>Author</th>
<th>Year</th>
<th>Number of education studies</th>
<th>Setting</th>
<th>% change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arnold &amp; Strauss</td>
<td>2005</td>
<td>23</td>
<td>AC</td>
<td>Nil</td>
</tr>
<tr>
<td>Forsetlund et al</td>
<td>2009</td>
<td>81</td>
<td>AC&amp;HC</td>
<td>6</td>
</tr>
<tr>
<td>ARHQ</td>
<td>2006</td>
<td>34</td>
<td>AC</td>
<td>10.6</td>
</tr>
<tr>
<td>Davey et al</td>
<td>2005</td>
<td>36</td>
<td>HC</td>
<td>8-69</td>
</tr>
<tr>
<td>Mansouri &amp; Lockyer</td>
<td>2007</td>
<td>31</td>
<td>AC&amp;HC</td>
<td>33</td>
</tr>
<tr>
<td>O’Brien et al</td>
<td>2007</td>
<td>69</td>
<td>AC&amp;HC</td>
<td>5.6</td>
</tr>
<tr>
<td>Ranji et al</td>
<td>2008</td>
<td>30</td>
<td>AC</td>
<td>9.7</td>
</tr>
</tbody>
</table>
OBJECTIVES

- Educational Interventions- typed, effectiveness
- New ways of improving learning and behaviour
- Web based learning – concepts and relevance to antimicrobial prescribing
- Availability of antimicrobial stewardship resource
- Competency and work based learning and assessment
Types of educational interventions and what are the most effective
Is Physician Education Effective in Promoting Antibiotic Stewardship?

http://www.shea-online.org/Portals/0/Policy_Brief_11.pdf

<table>
<thead>
<tr>
<th>Category</th>
<th>Strategy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Passive</td>
<td>Printed educational materials delivered to clinician by mail or electronically.</td>
</tr>
<tr>
<td></td>
<td>Clinical practice guidelines handed out by hospital.</td>
</tr>
<tr>
<td></td>
<td>Traditional continuing medical education (formal didactic lectures, seminars, and conferences).</td>
</tr>
<tr>
<td></td>
<td>Educational courses.</td>
</tr>
<tr>
<td>Active</td>
<td>Discussion groups for health professionals working in same facility.</td>
</tr>
<tr>
<td></td>
<td>Personal visit by trained health professional (educational outreach visits and academic detailing).</td>
</tr>
<tr>
<td></td>
<td>Interactive role-playing, hands-on-training, problem and case solving, and, educational workshops or conferences outside provider’s setting.</td>
</tr>
<tr>
<td></td>
<td>Sequenced education sessions (learn-work-learn).</td>
</tr>
</tbody>
</table>

A meta-analysis of the effectiveness of continuing medical education (CME) showed that active methods had a medium effect on prescribing behavior ($r = 0.33$) while passive methods had a small effect ($r = 0.20$) (Mansouri and Lockyer 2007). A review of studies testing interventions that changed the proportion of visits at which patients were prescribed antibiotics in ambulatory care showed a median effect of 12.9 percent (interquartile range 8.1–19.2 percent) for active education interventions versus 7.0 percent (interquartile range 5.0–10.1 percent) for passive education interventions (Kanji et al. 2008). Other reviews, however, found that passive education interventions had no effect (Arnold and Straus 2005; Satterlee et al. 2008). $r$ = correlation (Pearson correlation effect sizes: 0.10 = small, 0.24 = medium, and 0.37 = large).
Changing Clinician Behaviour
The Tool Box

• Education [adult learning theory]
  • Best if real-time, leadership-endorsed, repeated/sustained over time
• Feedback [social cognitive theory]
• Participation [management theory]
• Administrative changes [misanthropy]
• Incentives
• Penalties

Eisenberg… Medical Care 1985;23:461–483.
Adult Learning

- Learn throughout their lives
- Transitional stages – cause for learning
- Diverse learning approaches
- Problem-centered and relevant
- Immediacy of application [real time]
- Leadership-endorsed, repeated/sustained over time
- Past experiences
- Self-concept
- Self-directed
LEARNING DELIVERY & EFFECTIVENESS
Variable effectiveness.

- **Audit and feedback** - clinical performance observations, medical records or patient feedback.

- **The use of local opinion leaders** - Practitioners identified by their colleagues as influential in modelling and transmission of norms.

- **Local consensus processes** - Health providers in discussions designed to reach consensus on appropriate management strategies for specific health problems.

- **Patient mediated interventions** - intervention designed to change the performance of healthcare providers for which specific information was sought from or given to patients (such as clinical information collected directly from patients).
SAPG/SPAA Event March 2012
Stemming the Tide of antibiotic resistance (STAR)


A blended learning programme addressing appropriate antibiotic prescribing in general practice.

Reduction of 4.2% (95% CI=0.6%, 7.7%) in total oral antibiotic dispensing in the intervention group compared to the control group

Largest reductions in penicillin V and macrolides (p = 0.02)

No significant difference in hospitalisations or re-consultations
Effectiveness of multifaceted educational programme to reduce antibiotic dispensing in primary care: practice based randomised controlled trial

STAR

BMJ FEB 2012
ScARP – what is the ‘educational resource’?

Provided to prescribing support teams / AMTs in pilot boards
Made available to all boards after pilot

Pack – similar to NES pharmacy distance learning pack

Facilitator guide
- Key reference documents for background
- 60minute learning event guide (where to pause / suggestion questions to engage delegates on)

Delegate pre-reading materials
- NES HAI rxing vinegettes / RCGP resource

60minute learning event DVD
- Intended to be played by the facilitator
- Presents the information direct to delegates allowing facilitator to focus on delegate engagement as opposed to imparting information
FRAMEWORK FOR EDUCATION FOR STEWARDSHIP

How to educate prescribers in antimicrobial stewardship practices

Céline Pulcini1,2 and Inge C. Gyssens3,4,*

1Service d’Infectiologie; CHU de Nice; Nice, France; 2Faculté de Médecine; Université Nice-Sophia Antipolis; Nice, France; 3Radboud University Nijmegen Medical Centre and Canisius Wilhelmina Hospital; Nijmegen, The Netherlands; 4Hasselt University; Hasselt, Belgium

Keywords: antibiotic prescribing, antimicrobial stewardship, antibiotic policies, undergraduate curriculum, postgraduate education, clinical practice guidelines, intervention strategies, implementation

Abbreviations: BSAC, British Society for Antimicrobial Chemotherapy; CDC, Centers for Disease Control and Prevention; DOTS
WHO DO WE NEED TO INFLUENCE?

- Primary (9-11 y)
- Secondary (14-15 y)
- > 16 y

NATIONAL CAMPAIGNS

SHAPING BEHAVIOR

PREScribers of Antibiotics

- Undergraduate curriculum (18-23 y)
- Internship/foundation year (20-25 y)
- Professional training (20-30 y)

POSTGRADUATE EDUCATION
intervention strategies

Medical doctors, nurses, midwives, dentists, veterinarians
> 30 y

CHANGING BEHAVIOR

SHAPING BEHAVIOR

CHANGING BEHAVIOR
GOOD PRESCRIBING

The Consultation

- Prescribing in context
- Prescribing effectively
- Shared decision making
- Knowledge
- Options

- Safe
- Professional
- Always improving
- Information
- Self and others
- Healthcare system

ESCMID Online Lecture Library © by author
Table 1. Elements of education on prudent antibiotic prescribing

<table>
<thead>
<tr>
<th>Topic</th>
<th>Concept, understanding</th>
<th>Field, discipline</th>
<th>Principle, learning outcomes, competencies*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bacterial resistance</td>
<td>Selection, mutation</td>
<td>(Micro)biology, genetics</td>
<td>- Extent, causes of bacterial resistance in pathogens (low antibiotic concentration, long-term exposure of microorganisms to antibiotics is driving resistance)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Epidemiology</td>
<td>- Extent, causes of bacterial resistance in commensals and the phenomenon of overgrowth (e.g., Clostridium difficile infection, yeast infection)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Hygiene</td>
<td>- Epidemiology of resistance, accounting for local variations and experience of surveillance (differences between wards, countries...)</td>
</tr>
<tr>
<td>Antibiotics</td>
<td>Mechanisms of action of antibiotics/resistance</td>
<td>Pharmacology</td>
<td>- Spread of resistant organisms</td>
</tr>
<tr>
<td></td>
<td>Toxicity</td>
<td></td>
<td>- Broad vs. narrow spectrum antibiotics, preferred choice of narrow spectrum drug</td>
</tr>
<tr>
<td></td>
<td>Costs</td>
<td>Other, public health, immunology</td>
<td>- Combination therapy (co-therapy, limiting emergence of resistance, broadening the spectrum)</td>
</tr>
<tr>
<td>Diagnosis of infection</td>
<td>Infection/inflammation</td>
<td>Physiology/(microbiology, immunology)/Infectious diseases</td>
<td>- Consequences of bacterial resistance</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(Micro)biology</td>
<td>- Interpretation of clinical and laboratory biological markers</td>
</tr>
<tr>
<td></td>
<td>Susceptibility to antibiotics</td>
<td>Microbiology/infectious diseases</td>
<td>- Fever and C-Reactive Protein (CRP) elevation are also a sign of inflammation, not just an infection</td>
</tr>
<tr>
<td>Treatment of infection</td>
<td>Indication for antibiotic therapy</td>
<td>Clinical microbiology/ infectious diseases</td>
<td>- Practical use of point-of-care tests (e.g., urine dipstick, streptococcal rapid antigen diagnostic test in tonsillitis...)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Organ specialty</td>
<td>- Importance of taking microbiological samples for culture before starting antibiotic therapy</td>
</tr>
<tr>
<td>Prevention of infection</td>
<td>Pharmacotherapy, surgery, anesthesiology, clinical microbiology/ infectious diseases</td>
<td>- Definitions and indications of empiric/directed therapy vs. prophylaxis</td>
<td></td>
</tr>
<tr>
<td>Medical record keeping</td>
<td>Choice</td>
<td>Clinical medicine</td>
<td>- Clinical situations when not to prescribe an antibiotic:</td>
</tr>
<tr>
<td></td>
<td>Duration</td>
<td></td>
<td>- Colonization vs. infection (e.g., asymptomatic bacteriuria)</td>
</tr>
<tr>
<td></td>
<td>Timing</td>
<td></td>
<td>- Viral infections (e.g., acute bronchitis)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- Inflammation vs. infection (e.g., fever without a definite diagnosis in a patient with no severity criteria)</td>
</tr>
<tr>
<td>Prescribing antibiotics: initially</td>
<td>Empiric therapy (local guide, antibiotic booklet...)</td>
<td>Clinical microbiology/ infectious diseases/ organ specialists</td>
<td>- Surgical antibiotic prophylaxis: indication, choice, duration (short, timing)</td>
</tr>
<tr>
<td></td>
<td>Diagnostic uncertainty</td>
<td>Clinical pharmacology</td>
<td>- Estimating the shortest possible adequate duration</td>
</tr>
<tr>
<td>Prescribing antibiotics: targeted therapy</td>
<td>Communication with the microbiology laboratory</td>
<td>Clinical microbiology/ infectious diseases/ organ specialists</td>
<td>- Reassessment of the antibiotic prescription around day 3</td>
</tr>
<tr>
<td></td>
<td>Value of specialist consultation in infectious diseases or microbiology</td>
<td>Hospital pharmacy</td>
<td>- Streamlining/de-escalation once microbiological results are known</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- IV-oral switch (bioavailability of antibiotics)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- Therapeutic drug monitoring to ensure adequate drug levels (e.g., vancomycin)</td>
</tr>
</tbody>
</table>

*A competency is a quality or characteristic of a person that is related to effective performance. Competencies can be described as a combination of
COMPETENCY FRAMEWORK FOR TEACHING ON ANTIBIOTICS

• COMPETENCY – FOR EACH COMPETENCY STATE WHETHER YOU WISH FOR IT TO BE CATEGORISED AS APPLICATION OR AWARENESS

• APPLICATION - skills that the prescriber should apply regularly in their work and be able to carry out with minimal supervision

• AWARENESS- skills that the prescriber would not be expected to have acquired but sufficiently aware to seek help
# LEARNING OUTCOMES OF STEWARDSHIP WORKSHOPS

## Table 2. Main learning outcomes used to design antibiotic stewardship workshops

<table>
<thead>
<tr>
<th>Measuring antibiotic use</th>
<th>Auditing antibiotic use</th>
<th>Improving antibiotic use</th>
</tr>
</thead>
<tbody>
<tr>
<td>* Identify sources of data and understand how to measure antimicrobial use in the community and in hospitals*</td>
<td>* Choose and apply an audit methodology for monitoring the quality of antimicrobial prescriptions*</td>
<td>* Identify the steps and sources for evidence-based guideline development*</td>
</tr>
<tr>
<td>* Select proper measurement units to describe the volume of antimicrobial use*</td>
<td></td>
<td>* Describe the elements needed to launch a stewardship program in hospitals Identify barriers encountered in Antimicrobial Stewardship programs and how to overcome them*</td>
</tr>
<tr>
<td>* Interpret antimicrobial use data locally and within a multicenter network (benchmarking)*</td>
<td></td>
<td>* Make sense of interpersonal aspects of implementing change*</td>
</tr>
<tr>
<td>* Choose and apply a method to study the relationship between antimicrobial prescribing and bacterial resistance*</td>
<td></td>
<td>* Identify possible intervention strategies (and their relative advantages and disadvantages) which could be implemented in a hospital*</td>
</tr>
<tr>
<td></td>
<td></td>
<td>* Identify the electronic antimicrobial drug prescribing aids and their advantages and disadvantages*</td>
</tr>
<tr>
<td></td>
<td></td>
<td>* Build national and international support for Antimicrobial Stewardship programs*</td>
</tr>
<tr>
<td></td>
<td></td>
<td>* Select a proper method to study the effect of interventions in hospitals*</td>
</tr>
<tr>
<td></td>
<td></td>
<td>* Describe how an individual hospital can determine if its antimicrobial management program was economically successful and if it had an impact on bacterial resistance*</td>
</tr>
</tbody>
</table>
MANY TYPES OF E-LEARNING RESOURCE
Junior doctors are just the same as other young people!

Average age 27yrs

80% use Google to answer clinical queries

26% use Wikipedia to answer clinical queries

PODCASTS AS AN ADJUNCT LEARNING TOOL

Aid to learning course material

Perception amongst students as beneficial aid to revision

IMPACT OF PODCAST ON CLINICAL MICROBIOLOGY LEARNING AMONG MEDICAL STUDENTS
18.5% MEAN INCREASE IN STUDENT KNOWLEDGE POST PODCAST COMPARED TO PRE-PODCAST

[18 PODCASTS- 5-10 MINUTES ON e.g HAI, ANTIBIOTIC TREATMENT]
What is E-Learning?

“Learning experiences enabled or enhanced by technological resources that support the development, exchange, and application of knowledge, skills, attitudes, aspirations, or behaviours for the purpose of improving teaching and increasing student achievement.”

National Staff Development Council
For what purpose and reasons do doctors use the internet: a systematic review

Masters Ken Int J of Med Inform 2008; 7:4-16

All studies in developed world
N=38; 1994-2004
Primarily in North America
60-70% of doctors access internet; some 90%; all increasing; highest usage amongst UK doctors

Specific activities
52% access online journals
30% search/attend CME
48% MEDLINE & bibliography etc
70% literature searching
37% drug and dosage information
44% patient specific information
Junior doctors learning resource use regarding prescribing and resistance
Pulcini et al CMI 2011 17; 80-87

<table>
<thead>
<tr>
<th>NICE, FRANCE</th>
<th>DUNDEE, SCOTLAND</th>
</tr>
</thead>
<tbody>
<tr>
<td>In last 12 months</td>
<td>In last 12 months</td>
</tr>
<tr>
<td>Lectures 69%</td>
<td>Lectures 76%</td>
</tr>
<tr>
<td>Workshops 40%</td>
<td>Workshops 25%</td>
</tr>
<tr>
<td>Workplace informal 16%</td>
<td>Workplace informal 37%</td>
</tr>
<tr>
<td>Web-based 9%</td>
<td>Web-based 51%</td>
</tr>
</tbody>
</table>
Hybrid/Blended Learning

- Face-to-Face (F2F)
- Online Learning
- Move to 7 X 24 learning experience
- Structured discussions supplement class session
- Encourages quiet students to participate
- Opportunity for reflection
- Build & apply knowledge incrementally
FEATURES OF A TYPICAL E-LEARNING COURSE

CLEAR COURSE OBJECTIVES
COURSE INFORMATION, NOTICE BOARD, TIMETABLE
CURRICULUM MAP
TEACHING MATERIAL SUCH AS SLIDES, HANDOUTS, ARTICLES
COMMUNICATION VIA E-MAIL OR DISCUSSION BOARDS
FORMATIVE OR SUMMATIVE ASSESSMENTS
STUDENT MANAGEMENT TOOLS [RECORDS, STATS, TRACKING]
LINKS TO USEFUL INTERNAL AND EXTERNAL WEBSITES E.G LIBRARIES, ONLINE DATABASES, JOURNALS
EVALUATION OF THE COURSE [IN BUILT INTO THE LEARNING SYSTEM]
Is our program effective as opposed to are you satisfied?

Knowledge Acquisition → Knowledge Retention → Practice Improvement → Enhanced Patient Outcomes
## Levels of Educational Outcomes

<table>
<thead>
<tr>
<th>Participation</th>
<th>The number of people who registered and/or participated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Satisfaction</td>
<td>The degree to which participants’ expectations about the setting and delivery of the CME activity were met</td>
</tr>
<tr>
<td>Learning</td>
<td>Changes in self-reported knowledge of the participants; development of competence</td>
</tr>
<tr>
<td>Performance</td>
<td>Changes in observed practice performance; the application of learning; the application of competence</td>
</tr>
<tr>
<td>Patient Health</td>
<td>Changes in the health status of patients due to changes in participant practice behavior</td>
</tr>
<tr>
<td>Population Health</td>
<td>Changes in the health status of a population of patients due to changes in widespread practice behavior</td>
</tr>
</tbody>
</table>

Current EOM Methodologies & Tools

Follow-up surveys
Immediate pre- and post-activity surveys/tests
Control group surveys
Focus groups
Clinical assertions
Clinical/case vignettes
Commitment to change
Pre- and post-activity prescription measurement
Chart audits
QA data
Only patients with severe and/or refractory cases of urticaria should be managed with steroids.

Pre/Post/Follow-up Clinical Assertions with Control

Strongly agree
Strongly disagree

ANOVA
P < 0.001

n=390
n=1,753
n=1,374
n=335
n=229
n=67
n=372

FU = Follow-up survey
EM = Enduring material

Live only participants do not maintain learning

Live + EM participants maintain better learning through follow up

Educational Outcomes Measurement Plan (forum). Alliance for CME 31st Annual Conference; January 24, 2006; San Francisco, California.
Online Spaced Education (SE) is a novel, evidence-based form of online education that has been demonstrated in randomised trials to improve knowledge acquisition, boost retention and change behaviour.

SE involves participants receiving short, case-based multiple-choice questions and feedback via e-mail in a reinforcing pattern over a number of weeks.

The methodology is based on two core psychological research findings: the spacing and testing effects.

The **spacing effect** refers to the finding that educational encounters that are repeated over time increase the acquisition and retention of knowledge.

The **testing effect** refers to the finding that the process of testing does not merely measure knowledge, but actually alters the learning process itself to significantly improve knowledge retention.
Pilot Study: Spaced Ed Program

The 12-item adaptive spaced education course was structured as follows:

- Learners were sent two questions every two days.
- If a question was answered incorrectly, it was repeated 12 days later.
- If a question was answered correctly, it was repeated 24 days later.
- Once a question was answered correctly twice in a row, it was retired and not repeated again.
Course Objectives

1. Quantify the risks of infections transmissible by blood transfusions.
2. Appreciate risk factors for transmission of hepatitis C amongst close contacts of infected patients.
3. Understand recommendations for screening of Hepatitis C amongst newborns of mothers with chronic hepatitis C infection.
4. Appreciate the different pathological scoring systems for chronic hepatitis C.
5. Learn about the major extra hepatic manifestations of chronic hepatitis C.
6. Implement the guidelines for vaccination in those infected with chronic hepatitis C.
7. Predict treatment response for patients with chronic hepatitis C.
8. Understand the different treatment response categories (Non-response, end of treatment response, and sustained virologic response).

Objectives are clearly defined and noted at the start of each case.
Spaced Education: The Question

Today's Question
Choose your answer and click the 'Save' button to view results.

(5) Spaced Education on Chronic Hepatitis C Infection:
Harvard 'Update in Internal Medicine' Supplemental Course

Which of the following statements regarding the combination of chronic hepatitis C and cryoglobulinemia is correct?

- Patients with chronic hepatitis C and severe cryoglobulinemia are invariably cirrhotic
- Approximately 15% of patients with chronic hepatitis C have clinically significant cryoglobulinemia
- The cryocrit score does not correlate with severity of end organ damage
Spaced Education: The Feedback

Feedback
Your response has been saved. Feedback is shown below.

(5) Spaced Education on Chronic Hepatitis C Infection:
Harvard 'Update in Internal Medicine' Supplemental Course

Which of the following statements regarding the combination of chronic hepatitis C and cryoglobulinemia is correct?

- **The cryocrit score does not correlate with severity of end organ damage**
- Approximately 15% of patients with chronic hepatitis C have clinically significant cryoglobulinemia.
- Patients with chronic hepatitis C and severe cryoglobulinemia are invariably cirrhotic.

Feedback:
Correct Answer:
The cryocrit score does not correlate with severity of end organ damage

Explanation of Correct Answer:
The cryocrit is the percent precipitate within one ml of serum at 4 degrees Celsius. The cryocrit is generally between 2-7% in HCV associated cryoglobulinemia. There is no correlation between the cryocrit and the severity of organ involvement.

Explanation of Incorrect Answers:
- Approximately 15% of patients with chronic hepatitis C have clinically significant cryoglobulinemia. Although up to 50% of patients with chronic Hepatitis C have the presence of cryoglobulins (1) the development of symptomatic cryoglobulinemia is rare in the range of 1-2% (2).
- Patients with chronic hepatitis C and severe cryoglobulinemia are invariably cirrhotic. Cryoglobulinemia can occur in those with no fibrosis or cirrhosis. A recent large study revealed, however, that cirrhosis is more frequently detected in patients with chronic hepatitis C who are positive for the presence of cryoprecipitate. This suggests that the presence of cryoglobulins may be a useful prognostic indicator for increased risk of cirrhosis (3).
WHAT PROGRAMMES FOR ANTIMICROBIAL PRESCRIBING?
Navigating the web in search of resources on antimicrobial stewardship in health care institutions
Pagani et al CID 2009; 48: 626-32

- Comprehensive Web sites – international, many aspects
- Institutional Web sites for stewardship programmes
- Web sites from organisations and societies

Guidelines, news
Practice information for professionals
Education and teaching material: accessibility
Language
Links
Ease of navigation
Scope of information
Quality
Navigating the Web in Search of Resources on Antimicrobial Stewardship in Health Care Institutions

Leonardo Pagani,1 Inge C. Gyssens,2,3 Benedikt Huttner,4 Dilip Nathwani,5 and Stephan Harbarth1
1Division of Infectious Diseases, Bolzano Central Hospital, Bolzano, Italy; 2Nijmegen University Center for Infectious Diseases and Radboud University and 3Canisius-Wilhelmina Hospital, Nijmegen, The Netherlands; 4Geneva University Hospitals and Medical School, Geneva, Switzerland; and 5Ninewells Hospital and Medical

<table>
<thead>
<tr>
<th>Name of site or sponsor</th>
<th>URL</th>
<th>Country</th>
<th>Guidelines</th>
<th>News</th>
<th>Educational and teaching material</th>
<th>Material available in multiple languages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prudent Antibiotic User Website</td>
<td><a href="http://www.pause-online.org.uk/">http://www.pause-online.org.uk/</a></td>
<td>United Kingdom</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Cumbria National Health System, Acute Trust Antibiotic Guidelines</td>
<td><a href="http://www.cumbriapct.nhs.uk/medicinesmanagement/antibioticprescribingguidelines/2007/hospitalfrontpage.aspx">http://www.cumbriapct.nhs.uk/medicinesmanagement/antibioticprescribingguidelines/2007/hospitalfrontpage.aspx</a></td>
<td>United Kingdom</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
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<tr>
<td>Academy for Infection Management</td>
<td><a href="http://www.infectionacademy.org/">http://www.infectionacademy.org/</a></td>
<td>United States</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Premier Inc.</td>
<td><a href="http://www.premierinc.com/focusingonquality/tools-services/safety/topics/guidelines/other.jsp">http://www.premierinc.com/focusingonquality/tools-services/safety/topics/guidelines/other.jsp</a></td>
<td>United States</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Bugs and Drugs—Antimicrobial Reference Book</td>
<td><a href="http://www.bugsanddrugs.ca">http://www.bugsanddrugs.ca</a></td>
<td>Canada</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
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<tr>
<td>American Society of Health-System Pharmacists</td>
<td><a href="http://www.ashp.org/s_ashp/index.asp">http://www.ashp.org/s_ashp/index.asp</a></td>
<td>United States</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
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</table>

<table>
<thead>
<tr>
<th>Name of site or sponsor</th>
<th>URL</th>
<th>Ease of navigation</th>
<th>Practical information for professionals</th>
<th>Amount and scope of information</th>
<th>Teaching material to download</th>
<th>Material in multiple languages</th>
<th>Links to other Web sites</th>
</tr>
</thead>
<tbody>
<tr>
<td>Centers for Disease Control and Prevention</td>
<td><a href="http://www.cdc.gov/drugresistance/healthcare/default.htm">http://www.cdc.gov/drugresistance/healthcare/default.htm</a></td>
<td>Excellent</td>
<td>Yes</td>
<td>Large</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
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<tr>
<td>The Public Health Agency of Canada</td>
<td><a href="http://www.phac-aspc.gc.ca/cipars-pi-ec/index_e.html">http://www.phac-aspc.gc.ca/cipars-pi-ec/index_e.html</a></td>
<td>Excellent</td>
<td>No</td>
<td>Average</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
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<tr>
<td>Healthcare Infection Control Special Interest Group</td>
<td><a href="http://www.asid.net.au/hicsigwix/index.php?title=Antibiotic_stewardship_programs">http://www.asid.net.au/hicsigwix/index.php?title=Antibiotic_stewardship_programs</a></td>
<td>Excellent</td>
<td>Yes</td>
<td>Large</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
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<tr>
<td>DeBug Infection Prevention Program</td>
<td><a href="http://www.debug.net.au/index.html">http://www.debug.net.au/index.html</a></td>
<td>Excellent</td>
<td>Yes</td>
<td>Average</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
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<tr>
<td>Antibiotic Resistance Alliance Education Wisconsin</td>
<td><a href="http://www.areainitiative.org">http://www.areainitiative.org</a></td>
<td>Good</td>
<td>No</td>
<td>Average</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
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<tr>
<td>European Project Group &quot;ABS International&quot;</td>
<td><a href="http://www.abs-international.eu">http://www.abs-international.eu</a></td>
<td>Excellent</td>
<td>No</td>
<td>Average</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
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<tr>
<td>Antibiotic Resistance Prevention and Control</td>
<td><a href="http://www.abdn.ac.uk/arcpc/">http://www.abdn.ac.uk/arcpc/</a></td>
<td>Good</td>
<td>No</td>
<td>Small</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
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<tr>
<td>The Scottish Government—Health and Community Care</td>
<td><a href="http://www.scotland.gov.uk/Publications/2005/09/02132609/26099">http://www.scotland.gov.uk/Publications/2005/09/02132609/26099</a></td>
<td>Excellent</td>
<td>Yes</td>
<td>Large</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Appropriate Antibiotic Prescribing</td>
<td><a href="http://www.dundee.ac.uk/sacmedden/ART/index.htm">http://www.dundee.ac.uk/sacmedden/ART/index.htm</a></td>
<td>Excellent</td>
<td>Yes</td>
<td>Large</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>National Resource for Infection Control</td>
<td><a href="http://www.nric.org.uk/IntegratingCRF/NSR/NRIC_Policy_AntimicrobialPrescribing?OpenForm">http://www.nric.org.uk/IntegratingCRF/NSR/NRIC_Policy_AntimicrobialPrescribing?OpenForm</a></td>
<td>Excellent</td>
<td>Yes</td>
<td>Large</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>The Dutch Working Party on Antibiotic Policy</td>
<td><a href="http://www.swab.nl/swab/swabcrms.nl/showfs/foreign">http://www.swab.nl/swab/swabcrms.nl/showfs/foreign</a></td>
<td>Good</td>
<td>Yes</td>
<td>Average</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>
WEB BASED RESOURCE: CRITIQUE

Mainly limited to hospital stewardship
Good educational resource for teaching and link to guidelines
Need more based in the community
Primarily developed world based and in English language
Generally free but lack of transparency and update in many
Some industry sponsored
Limited ability to discuss or feedback

Little ability to undertake reflection or assessment: need to consider how it can support work based assessment
Welcome to the Pause Website

The aim of the Pause Website is to ensure that medical practitioners will be prudent prescribers of antibiotics and will promote prudent use of antibiotics in whatever clinical context they are working in.

The objectives of the Pause website are to:

- Construct a framework of learning outcomes that defines a prudent prescriber.
- Promote reflective learning to ensure practitioners maintain and develop their expertise in prudent prescribing.
- Provide flexible web-based learning resources and assessments that will enable undergraduate medical students to achieve clearly defined learning outcomes in prudent prescribing, for their level of expertise.
- Create a collaborative web-based forum for sharing experience and learning resources between providers of education in the context of prudent prescribing.
- Provide an exemplary learning platform in prudent antibiotic prescribing for the development of other healthcare professionals.

Why Are Antibiotics Making Us Ill??

Standard Competency Headings

1. Consider diagnosis
2. Assess severity
3. Initiate investigations
4. Consider infection control
5. Assess need for antimicrobials
6. Consider other aspects of management
Work based assessment - tools for prudent prescribing learning

• Mini CEX
• Case Based Discussion

• Directly observed procedure (DOP)

• $360^\circ$ MSF
• Reflection by evidence of record of experience
• Significant event analysis

Impact of WBA on doctors education and performance: a systematic review
BMJ 2010; 341:c5064
1. Policy context: national and local strategic approaches

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Process</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1 Local antibiotic policy understood and followed.</td>
<td>Locate and study the local antibiotic policy.</td>
<td>Practitioners can enter the Date of achievement of the Outcome and Sign here.</td>
</tr>
</tbody>
</table>

Practitioners may wish to discuss their progress and activities on an occasional basis with their manager, mentor or supervisor – they can record this here [OPTIONAL].

The manager, mentor or supervisor can countersign to authenticate achievements in relation to the Activities here [OPTIONAL].

Notes on discussion with manager/mentor/supervisor

<table>
<thead>
<tr>
<th>Countersigned</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
</tr>
</tbody>
</table>

Practitioners can briefly describe the Activity they undertook to achieve the Outcome here.
ANTIBIOTIC PRESCRIBING EDUCATION

Evidence supports the value of education.

Adult learning theory supports a diverse range of effective measures to learn.
Learning about prescribing needs to be structured within a framework.

Spaced education may support long term retention and improved performance.
Measuring effectiveness of educational programmes is increasingly important to assess value.
Increasing web based resource but of variable quality.