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Effectiveness of interventions to improve the public's antimicrobial resistance awareness and behaviours associated with prudent use of antimicrobials: a systematic review

Journal Item

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Supplementary Table S1. An example of search strategy applied for MEDLINE database.

MEDLINE

Context

- 1 (superbug* OR superinfection*):ti,ab
- 2 MH "Superinfection"
- 3 (multiresistant OR multiresistance OR "multi-resistant" OR "multi-resistance" OR MDR OR MDRO OR AMR):ti,ab
- 4 ((drug* OR multidrug OR "multi-drug" OR antimicrobial* OR "anti-microbial*" OR antiinfection* OR "anti-infection*" OR antibacterial* OR "anti-bacterial*" OR antibiotic* OR "anti-biotic*") N4 (resistant OR resistance OR tolerant OR tolerance)):ti,ab
- 5 MH "Drug Resistance"
- 6 MH "Drug Resistance, Microbial+"
- 7 MH "Drug Resistance, Multiple+"
- 8 MH "Drug Tolerance"
- 9 ("r factor*" OR "resistant factor*"):ti,ab
- 10 MH "R Factors"
- 11 ((antimicrobial OR "anti-microbial" OR antiinfection OR "anti-infection" OR antibacterial OR "anti-bacterial" OR antibiotic OR "anti-biotic") N4 (stewardship)):ti,ab
- 12 MH "Anti-Infective Agents"
- 13 MH "Anti-Bacterial Agents"
- 14 OR/1-13

Population

- 15 (public OR population OR community OR citizen* OR household* OR resident* OR consumer* OR carer* OR caregiver* OR people OR adult* OR men OR women OR mother* OR father* OR parent* OR student* OR pupil* OR children OR adolescent* OR teenager*):ti,ab
- 16 MH "Caregivers"
- 17 MH "Men"
- 18 MH "Women"

- 19 MH "Parents"
- 20 MH "Fathers"
- 21 MH "Mothers"
- 22 MH "Students"
- 23 OR/17-22

Intervention

- 24 (intervention*):ti,ab
- 25 (training OR teaching OR education OR program* OR initiative* OR workshop* OR seminar* OR module* OR session* OR curriculum):ti,ab
- 26 MH "Teaching"
- 27 MH "Teaching Materials"
- 28 MH "Education"
- 29 MH "Models, Educational"
- 30 MH "Health Education"
- 31 MH "Education, Nonprofessional"
- 32 MH "Curriculum"
- 33 ((written OR printed OR online OR oral OR disseminat* OR provi*) N2 (information OR advice OR resource* OR material*)):ti,ab
- 34 (pamphlet* OR handout* OR poster* OR leaflet* OR newsletter* OR brochure* OR booklet* OR TV OR television OR radio OR marketing OR adverti?ing OR publicity OR campaign* OR "mass media" OR "communication media" OR outreach OR computer* OR Internet OR online OR website* OR "social media" OR "social network*" OR Facebook OR Twitter OR tweet OR blog* OR SMS OR "short messaging service*" OR text* OR email* OR podcast* OR smartphone* OR ((mobile OR cell OR smart) N1 (phone* OR telephone* OR app* OR application*)):ti,ab
- 35 MH "Consumer Health Information"
- 36 MH "Health Promotion"
- 37 MH "Health Communication"
- 38 MH "Persuasive Communication"
- 39 MH "Public Health"
- 40 MH "Audio Visual Aids"

- 41 MH "Manuals as Topic"
- 42 MH "Pamphlets"
- 43 MH "Advertising as Topic"
- 44 MH "Marketing"
- 45 MH "Social Marketing"
- 46 MH "Mass Media"
- 47 MH "Social Networking"
- 48 MH "Social Media"
- 49 OR/24-48

Outcomes

- 50 MH "Program Evaluation"
- 51 ((behavio#r N3 (change* OR changing OR alter* OR modification* OR modify OR modifying OR modifies OR modified)) OR intention*):ti,ab
- 52 MH "Motivation"
- 53 MH "Intention"
- 54 (attitude* OR belief* OR view* OR opinion* OR expectation* OR "anticipat* regret" OR knowledge OR awareness OR "health literacy" OR "risk perception*" OR "perceived risk*" OR "perceived susceptibility" OR "illness perception*" OR "treatment perception*"):ti,ab
- 55 MH "Attitude to Health"
- 56 MH "Health Knowledge, Attitudes, Practice"
- 57 MH "Health Literacy"
- 58 ("perceived behavio#ral control" OR autonomy OR capacity OR "self-efficacy" OR competen* OR confidence OR ability OR skill*):ti,ab
- 59 MH "Self Efficacy"
- 60 ("perceived norm*" OR "injunctive norm*" OR "subjective norm*" OR "descriptive norm*" OR "moral norm*" OR "self-identity"):ti,ab
- 61 MH "Social Norms"
- 62 ((medication* OR drug* OR antimicrobial* OR "anti-microbial*" OR antiinfection* OR "anti-infection*" OR antibacterial* OR "anti-bacterial*" OR antibiotic* OR "anti-biotic*") N4 (use OR used OR usage OR consumption OR purchas* OR dispos* OR storage OR storing OR sharing OR shared OR expect* OR request*)):ti,ab

- 63 ((inappropriat* OR irrational OR imprudent OR unnecessar* OR irresponsibl* OR misuse* OR improper* OR mistake* OR indiscriminat* OR suboptimum* OR bad OR overuse* OR excessiv* OR vary OR varied OR variation OR poor OR unsafe*) N4 (use OR usage OR utili?e OR treatment OR consumption OR purchas* OR dispos* OR storage OR sharing OR shared OR expectation* OR request*)):ti,ab
- 64 ((appropriat* OR rational OR prudent OR judicious* OR optimal* OR correct OR proper* OR responsibl* OR safe* OR good OR decreas* OR limit* OR curb* OR minimi?e* OR minimal* OR lessen* OR curtail* OR abate* OR restrict* OR lower* OR discontinue* OR delay*) N4 (use OR usage OR utili?e OR treatment OR consumption OR purchas* OR dispos OR storage OR sharing OR shared OR expectation* OR request*)):ti,ab
- 65 MH "Drug-Seeking Behavior"
- 66 (compliance OR concordance OR adherence):ti,ab
- 67 MH "Medication Adherence"
- 68 ("self-car*" OR "self-manag*" OR "self-monitor*" OR "self-medicat*"):ti,ab
- 69 MH "Self Care"
- 70 MH "Self Medication"
- 71 OR/50-70

Combination of all search strings

- 72 AND/14,23,49,71
- 73 Limit 72 to year 2000
-

Supplementary Table S3. Excluded studies with rationale.

Design other than RCT, NRT, CBA or NCBA study

1. Anonymous. Interprofessional advice for the public on responsible use of antibiotics. *Vet Rec* 2014; **174**: 136.
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6. Gibson JL. Lessons learned from a student-initiated antibiotic awareness program. *Am J Health Syst Pharm* 2006; **63**: 1590-1592.
7. Hoekstra B, Lecky D, Young V. E-Bug: hygiene and antibiotic awareness for school-aged children. *Community Pract* 2014; **87**: 36-38.
8. Huttner B, Goossens H, Verheij T *et al.* Characteristics and outcomes of public campaigns aimed at improving the use of antibiotics in outpatients in high-income countries. *Lancet Infect Dis* 2010; **10**: 17-31.
9. Kim SO, Kim NS, Ji SM *et al.* *Antibiotic use and related awareness of physician, pharmacist and consumer*. Seoul: Korea Food and Drug Administration, 2004.
10. Lecky DM, McNulty CAM, Adriaenssens N *et al.* Development of an educational resource on microbes, hygiene and prudent antibiotic use for junior and senior school children. *J Antimicrob Chemother* 2011; **66** Suppl 5: v23-v31.
11. Lecky DM, McNulty CAM, Adriaenssens N *et al.* What are school children in Europe being taught about hygiene and antibiotic use? *J Antimicrob Chemother* 2011; **66** Suppl 5: v13-v21.
12. Lecky DM, McNulty CAM. E-Bug implementation in England. *J Antimicrob Chemother* 2011; **66** Suppl 5: v63-v66.

13. Lecky DM, McNulty CAM. Current initiatives to improve prudent antibiotic use amongst school-aged children. *J Antimicrob Chemother* 2013; **68**: 2428-2430.
14. Lee CR, Lee JH, Kang L *et al*. Educational effectiveness, target, and content for prudent antibiotic use. *Biomed Res Int* 2015; **2015**: 214021.
15. McCarthy M. Many US parents have poor understanding of proper antibiotic use, study finds. *BMJ (Online)* 2015; **351**: h4009.
16. McNulty CAM, Cookson BD, Lewis MAO. Education of healthcare professionals and the public. *J Antimicrob Chemother* 2012; **67** Suppl 1: i11-i18.
17. Newell L, Norris P. Children's understanding of the role of medicines in treating infectious illnesses. *N Z Med J* 2004; **31**: 310-313.
18. Olczak-Pienkowska A, Grzesiowski P. Progress towards implementing the e-Bug Project in Poland. *J Antimicrob Chemother* 2011; **66** Suppl 5: v77-v79.
19. Smith RA, Quesnell M, Glick L *et al*. Preparing for antibiotic resistance campaigns: a person-centered approach to audience segmentation. *J Health Commun* 2015; **20**: 1433-1440.
20. Weekes LM, Mackson JM, Artist MA *et al*. An ongoing national programme to reduce antibiotic prescription and use. *Microbiol Aust* 2007; **28**: 201-204.

Participants recruited from HC settings

1. Alden DL, Tice AD, Berthiaume JT. Investigating approaches to improving appropriate antibiotic use among higher risk ethnic groups. *Hawaii Med J* 2010; **69**: 260-263.
2. Bauchner H, Osganian S, Smith K *et al*. Improving parent knowledge about antibiotics: a video intervention. *Pediatrics* 2011; **108**: 845-850.
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9. Tramontina MY, Dos Santos L, Heineck I. Use of non-formulary drugs in children at a Brazilian teaching hospital: a descriptive study. *Pharm Pract* 2013; **11**: 17-23.
10. Valente P, Lora PS, Landell MF *et al.* A game for teaching antimicrobial mechanisms of action. *Med Teach* 2009; **31**: e383-e392.
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Context other than AMR

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2. Lee AL. Who are the opinion leaders? The physicians, pharmacists, patients, and direct-to-consumer prescription drug advertising. *J Health Commun* 2010; **15**: 629-655.
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4. Reid RJ. Harm reduction and injection drug use: pragmatic lessons from a public health model. *Health Soc Work* 2002; **27**: 223-226.
5. van Leeuwen E. Research on controlled drug use: a paradigm for public health research in sustainable health. *Am J Bioeth* 2016; **16**: 50-52.

Outcomes not related to AMR awareness antimicrobial stewardship

1. Ashe D, Patrick PA, Stempel MM *et al.* Educational posters to reduce antibiotic use. *J Pediatr Health Care* 2006; **20**: 192-197.
2. Cates C. An evidence based approach to reducing antibiotic use in children with acute otitis media: controlled before and after study. *BMJ* 1999; **318**: 715-716.
3. Italian Medicines Agency. *Communication campaign: "Antibiotics yes, but with caution"*. Rome: Italian Medicines Agency, 2008. http://www.agenziafarmaco.gov.it/allegati/relazione_rasi_111108.pdf
4. Filippini M, Ortiz LGG, Masiero G. Assessing the impact of national antibiotic campaigns in Europe. *Eur J Health Econ* 2013; **14**: 587-599.
5. Anonymous. Community-wide interventions prove modestly successful in reducing antibiotic use among Medicaid-insured children. *AHRQ Res Act* 2008; **334**: 8.
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Full text not available

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9. Soleymani F, Mohammadhosseini N, Mohammadzadeh S *et al*. Utilizing storytelling to promote rational antibiotic use in 9-11 years old school children in Iran. *Value Health* 2013; **16**: A456.
10. Stanic M, Skocibusic N, Vlahovic-Palcevski V. Trends in antibiotic consumption upon implementation of educational measures. *Clin Ther* 2015; **37**: e42.

Other

Conference abstract of already reviewed study

1. Farrell D, Kostkova P, Weinberg J *et al.* Can web games teach children hygiene and antibiotic resistance? Evaluation of the e-bug junior games. *Clin Microbiol Infect* 2010; **16** Suppl 2: S562.

Full text not available in English/inability to translate

1. Kim SS, Cheon JY, Kwon IS *et al.* Development and evaluation of a web-based education program on appropriate antibiotic use in Korean adolescents. *J Korean Acad Nurs* 2011; **18**: 383-391.

Article that refers to already reviewed study

1. Kostkova P, Farrell D, De Quincey E *et al.* Ebug-teaching children hygiene principles using educational games. *Stud Health Technol Inform*; **160**: 600-604.

Protocol of already reviewed study

1. Local Campaign on Antibiotics Alliance Study Group. Doctors and local media: a synergy for public health information? A controlled trial to evaluate the effects of a multifaceted campaign on antibiotic prescribing (protocol). *BMC Public Health* 2011; **11**: 816.

Majority (74.3%) of respondents were HC professionals

1. Madle G, Kostkova P, Weinberg J. Bugs and drugs on the Web: changes in knowledge of users of a web-based education resource on antibiotic prescribing. *J Antimicrob Chemother* 2008; **63**: 221-223.