O controlo de infecção na comunidade: é possível?
A perspectiva académica

José Artur Paiva
Centro Hospitalar São João
Faculdade de Medicina da Universidade do Porto
Grupo de Infecção e Sepsis
Growing antimicrobial resistance

United States, 2011 -
9.7% ESBL(+) in Ec
12.7% ESBL(+) in Kp
5% KPC(+) in Kp
ESBL(+) Kp: ETP 52%, IPM 58%
Pa: IPM 76%, FEP 73%, LVX 73%
Ab: IPM 61%, FEP 34%, LVX 26%

Europe, 2010 -
11% ESBL(+) in Ec
23% ESBL(+) in Kp
ESBL(+) EB: ETP 91%, IPM 93%
EB: CRO 80%, LVX 78%

China, 2010 -
65.8% ESBL(+) in Ec
35.4% ESBL(+) in Kp
EB: CRO 38%, FEP 50%, LVX 44%
Pa: IPM 69.6%
Ab: IPM 30.8%

Taiwan, 2006-2010
7.6% ESBL(+) in Ec
8.2% ESBL(+) in Kp
EB: FEP 95%, LVX 81.7-87.2%

Asia-Pacific, 2010 -
40.8% ESBL(+) in Ec
26.9% ESBL(+) in Kp
ESBL(+) Ec: ETP 99%, FEP 6%
ESBL(+) Kp: ETP 92%, FEP 19%
Pa: IPM 62%, FEP 65%, LVX 71%
Ab: IPM 21%, FEP 18%, LVX 23%

Latin America -
2009, 31.2% ESBL(+) in Ec
2012, 41.2% ESBL(+) in Kp
2012, ESBL(+) Kp: ETP 68%, IPM 73%

Africa*, 2011 -
4% ESBL(+) in Ec
36% ESBL(+) in Kp
ESBL(+) Kp: ETP 90%, IPM 95%

Middle East -
2009, 38.6% ESBL(+) in Ec
2011, 45% ESBL(+) in Kp
2011, ESBL(+) Kp: ETP 67%, IPM 82%
2012, Pa: IPM 75%, FEP 86%, LVX 80%
2012, Ab: IPM 8%, FEP 8%, LVX 4%

New Zealand, 2010 -
3.3% ESBL(+) in Ec
8.0% ESBL(+) in Kp
Pa: IPM 98%
Ab: IPM 100%

WHO priority pathogens list for R&D of new antibiotics

**Priority 1: CRITICAL**
- *Acinetobacter baumannii*, carbapenem-resistant
- *Pseudomonas aeruginosa*, carbapenem-resistant
- *Enterobacteriaceae*, carbapenem-resistant, ESBL-producing

**Priority 2: HIGH**
- *Enterococcus faecium*, vancomycin-resistant
- *Staphylococcus aureus*, methicillin-resistant, vancomycin-intermediate and resistant
- *Helicobacter pylori*, clarithromycin-resistant
- *Campylobacter spp.*, fluoroquinolone-resistant
- *Salmonellae*, fluoroquinolone-resistant
- *Neisseria gonorrhoeae*, cephalosporin-resistant, fluoroquinolone-resistant

**Priority 3: MEDIUM**
- *Streptococcus pneumoniae*, penicillin-non-susceptible
- *Haemophilus influenzae*, ampicillin-resistant
- *Shigella spp.*, fluoroquinolone-resistant

A recent meta-analysis, that included 66 papers, found a pooled prevalence of colonization of healthy individuals in the community by ESBL-producing *Enterobacteriaceae* to be 14% (95% CI, 9-20), and estimated that this was likely to increase by 5.38% annually.

The global dissemination of plasmidborne carbapenemases now represents an additional level of threat

- Carbapenem resistance in *E. coli* is rare in Europe, but has become prevalent in *K. pneumoniae* (59.4% in Greece, 34.3% in Italy, 20.5% in Romania, and less than 2% in other EU countries)
- 13 out of 38 countries reported inter-regional spread. Only three out of 38 countries replied that they had no single case of CPE
- These isolates are usually sensitive to colistin, fosfomycin and tigecycline and prescriptions of colistin almost doubled in Europe between 2010 and 2014; however, resistance to these antibiotics is also rapidly emerging.
- First plasmid mediated polymixin resistance mechanism in Enterobacteriaceae in animals and human beings, reported in China
- Plasmid-mediated colistin resistance gene (mcr-1) has been rarely found in human isolates in Europe and its clinical significance is currently unknown.
- Major concerns have especially been raised following recent reports of *Enterobacteriaceae* strains co-carrying plasmid-borne *mcr-1* and carbapenemase- encoding genes

Akova M. Virulence 2016; 7:252–266

Standard definitions for acquired antibiotic resistance

- **Multi-drug-resistant (MDR):** non-susceptible to at least 1 agent in 3 antimicrobial categories
- **Extensively-drug-resistant (XDR):** non-susceptible to at least 1 agent in all but 2 or fewer antimicrobial categories
- **Pan-drug-resistant (PDR):** non-susceptible to all agents in all antimicrobial categories


- **Both in the US and the EU,** in 2013, > 2 million people were diagnosed with antibiotic-resistant infections, with at least 23,000 dying as a result
- **If this trend continues,** mortality attributable to AMR in 2050 will be 390,000 in Europe and 10 million globally, resulting in a reduction of the European GDP by between 1% and 4.5% by 2050

Estruturas Residenciais para Pessoas Idosas
Prevalence of HAI in nursing homes

- A point prevalence study including several European countries reported that in 2013, 3.4% of nursing home residents had an HAI, with the prevalence rate in individual countries ranging from 0.4 to 7%.

Antibiotic Prescription in Nursing Homes

- staffing is different
- decision making is different
- patient population differs in many ways.

Twelve Common Nursing Home Situations for Which Systemic Antibiotics Are Often Prescribed but Rarely Indicated

1. Positive urine culture in an asymptomatic patient.
2. Urine culture ordered solely because of a change in urine appearance.
3. Nonspecific symptoms or signs not referable to the urinary tract (with or without a positive urine culture).
4. Upper respiratory infection (common cold).
5. Bronchitis or asthma in a patient who does not have advanced chronic obstructive pulmonary disease.
6. Infiltrate on chest x-ray in the absence of clinically significant symptoms.
7. Suspected or proven influenza in the absence of a secondary infection (but do treat influenza with antivirals).
8. Respiratory symptoms in a patient with advanced dementia, a patient on palliative care, or a patient at the end of life.
9. Skin wound without cellulitis, sepsis, or osteomyelitis (regardless of culture result).
10. Small (<5 cm) localized abscess without significant surrounding cellulitis (drainage is required of all abscesses).
11. Decubitus ulcer in a patient at the end of life.
12. Acute vomiting and/or diarrhea in the absence of a positive culture for Shigella or Salmonella, or a positive toxin assay for Clostridium difficile.
Frail and older adults receiving care in nursing homes are at higher risk of infections due to age-related immune senescence, accumulation of comorbid conditions and a higher burden of functional and cognitive deficits that increase dependence on caregivers.

The social and interactive nature of nursing homes such as shared dining, recreation, and therapeutic facilities generates opportunities for communicable diseases to spread.

There is growing complexity of medical care delivered in these settings: invasive medical devices (e.g., urinary and vascular catheters), wound management, and healthcare and antibiotic exposure.
Not all patients are alike
Risk Factors for Multidrug-Resistant Organisms in Nursing Homes

- recent antibiotic exposure (within 4 months)
- dependence upon assistance with activities of daily living
- presence of indwelling medical devices
- decubitus ulcers
- presence of wounds
- urinary and fecal incontinence

The time to acquisition varied based on the bacteria:
- an average of 186 days (±108) for VRE
- 127 days (±79) for MRSA
- 76 days (±66) for ciprofloxacin-resistant Gram-negative bacilli.
Interconnectedness of acute care hospitals and post-acute and long-term care settings

Among nursing home residents who became infected with an MDRO, 57% became positive in nursing homes and 41% in acute care settings.


Study on the epidemiology of carbapenem-resistant *Acinetobacter baumannii* and *Klebsiella pneumoniae* strains in Northeast Ohio found two predominant genotypes of each species among patients at three regional hospitals and one long-term acute care facility.

Need for consideration of regional approaches to infection prevention and control

Evidence of benefit spillover

Contact precautions for nursing home residents colonized for MRSA, with a 50% adherence rate, might reduce the prevalence of MRSA by 14% in nursing home settings and 2% in hospital settings.

Further modeling of universal MRSA decolonization of ICU residents projected a 3.0 and 1.9% reduction in the prevalence of MRSA colonization in long-term acute care and nursing homes, respectively.

Creating a multidisciplinary task force can:

- facilitate the standardization of infection prevention guidelines,
- improve interfacility communication about MDRO during care transitions
- provide expertise.

Just as the burden and transmission of an MDRO in one setting may affect regional healthcare, efforts to reduce MDRO colonization in one setting has the potential to reduce the risk of MDRO infections in other institutions, creating regional benefits.
Identify barriers

Challenges to Implementing MDRO Prevention in Nursing Homes

- paucity of evidence that addresses MDRO transmission during the care of nursing home residents,
- most nursing homes do not perform active surveillance cultures,
- limited staff resources in nursing homes,
- insufficient infection prevention education in nursing homes,
- perceptions by nursing home staff that isolation and contact precautions negatively influence the well being of their residents.

*Dumyati G et al. Curr Infect Dis Rep 2017; 19: 18*
Addressing the Challenges of MDRO Prevention and Control in Nursing Homes

a shift in MDRO prevention strategies
away from an approach based on the knowledge of a resident harboring a specific pathogen
and toward an approach based on knowledge of resident risk factors for MDRO transmission and acquisition,
such as the uncontained bodily fluids and indwelling devices

Example:
• Basing barrier precautions on the presence of an indwelling device or specific task, such as assistance with bathing, is much easier for all staff members to understand and incorporate into their workflow.
Transmission-based precautions could be applied proactively to nursing home residents based on their individual risk factors.

- potential to **reduce the risk of MDRO transmission**
- may **reduce the social discomfort** associated with having an MDRO
- may help **decentralize the responsibility** for infection prevention and control from a single individual to several staff members
Addressing the Challenges of MDRO Prevention and Control in Nursing Homes

- Knowledge-oriented strategies
  - education
  - bundles

- Behaviour oriented strategies
  - estratégias facilitadoras: removal of barriers and blockers to change
  - directive strategies: incentives, motivations
A National Project to Prevent Catheter-Associated Urinary Tract Infection in Nursing Home Residents

- A large-scale prospective implementation project was conducted in 568 community-based nursing homes across 48 states participating in the Agency for Healthcare Research and Quality Safety Program for Long-Term Care. Between March 1, 2014, and August 31, 2016.

- **INTERVENTIONS:** included a technical bundle: catheter removal, aseptic insertion, using regular assessments, training for catheter care, and incontinence care planning, as well as a socioadaptive bundle emphasizing leadership, resident and family engagement, and effective communication.

- **RESULTS:**
  - The unadjusted catheter-associated UTI rates decreased from 6.78 to 2.63 infections per 1000 catheter-days.
  - With use of the regression model and adjustment for facility characteristics, the rates decreased from 6.42 to 3.33 (incidence rate ratio [IRR], 0.46; 95% CI, 0.36-0.58; P < .001).
  - Catheter utilization remained unchanged (4.50 at baseline, 4.45 at conclusion of project)
  - The number of urine cultures ordered for all residents decreased from 3.49 per 1000 resident-days to 3.08 per 1000 resident-days.

- **CONCLUSIONS AND RELEVANCE:**

  In a large-scale, national implementation project involving community-based nursing homes, combined technical and socioadaptive catheter-associated UTI prevention interventions successfully reduced the incidence of catheter-associated UTIs.

For example:
- BP control can save more lives than any other clinical intervention
- It is successful in only about half of treated Americans
- Nearly 90% of patients with uncontrolled hypertension have both health insurance and a regular source of care
- More than 80% have multiple contacts with the health system each year
Addressing the Challenges of MDRO Prevention and Control in Nursing Homes

- Knowledge-oriented strategies
  - education
  - bundles

- Behaviour oriented strategies
  - estratégias facilitadoras:
    - removal of barriers and blokers to change
  - directive strategies:
    - incentives, motivations
"Priming" can influence hand hygiene compliance in clinical environments

- RCT in a SICU at a teaching hospital in Miami, Florida.
- The primary outcome data involved observations: a mix of health professionals and service users were observed entering the SICU by 2 trained observers and their hand hygiene compliance was independently verified.

**Interventions included either an olfactory prime (clean, citrus smell) or visual prime (male or female eyes).** The primary outcome measure was hand hygiene compliance (HHC) measured by the visitor using the hand gel dispenser.

- At a 5% level there was significant evidence that a **clean, citrus smell significantly improves HHC** (46.9% vs. 15.0%, p = .0001).
- Compared to control group, a significant improvement in HHC was seen when a picture of "male eyes" was placed over the hand gel dispenser (33% vs. 15%, p < .038).
- No significant improvement in HHC was seen when a picture of female eyes was placed over the same hand gel dispenser (10.0% vs. 15.0%, p = .626).

Psychosocial determinants of self-reported hand hygiene behaviour: a survey comparing physicians and nurses in intensive care units.

- A cross-sectional survey using a self-administered questionnaire that applied concepts from the Health Action Process Approach on hygienic hand disinfection was conducted in 10 ICUs and two haematopoietic stem cell transplantation units at Hannover Medical School, Germany.
- The associations between action control (self-regulatory strategies where behaviour is evaluated continuously and automatically against guidelines) and compliance indicate that HHB is a habit in need of self-monitoring.
- The fact that perceived cooperation on the ward was the only environmental correlate of HHB among physicians stresses the importance of team-directed interventions.

Regarding antibiotic prescription:
Interventions must be interdisciplinary and setting-specific, and make efficient use of the limited quality improvement resources available in most nursing homes

- target the areas where antibiotics are most often overprescribed: for presumed urinary, respiratory, skin, or soft tissue infections
- assess how each nursing home is performing vis-à-vis its peers, adjusting for differences in resident populations – benchmarking
- Facility-level or system-level antibiograms can help nursing homes set evidence-based guidelines for empirical antibiotic prescribing
- monitor ongoing antibiotic prescriptions and monitor for harms of antibiotic overuse and also for possible harms of withholding antibiotics, providing regular feedback
- Guide prescription by specific symptoms and signs rather than by cultures
- Coordinate with emergency departments

Focus on what to avoid rather than what to do: when not to prescribe antibiotics
Can evidence-based medicine and clinical quality improvement learn from each other?

Paul Glasziou,¹ Greg Ogrinc,² Steve Goodman³

ABSTRACT
The considerable gap between what we know from research and what is done in clinical practice is well known. Proposed responses include the Evidence-Based Medicine (EBM) and Clinical Quality Improvement. EBM has focused more on ‘doing the right things’—based on external research evidence—whereas Quality Improvement (QI) has focused more on ‘doing things right’—based on local processes. However, these are complementary and in combination direct us how to ‘do the right things right’. This article examines the differences and similarities in the two approaches and proposes that by integrating the bedside application, the methodological development and the training of these complementary disciplines both would gain.

Clinical audit

- An audit is an examination or review that assesses and reports on the extent to which a condition, process or performance matches predetermined standards or criteria.
- to see how they are doing and to identify opportunities for improvement.
- Changes can then be made to bring practice in line with these standards so as to improve the quality of care and health outcomes
- followed by further audits to see if these changes have been successful.
- A tool not a goal
From Audit to Improvement

- Audit is the cyclical process of assessing current services against set standards, acting to bring practice in line with the standards, reviewing again, and so on.
- Its primary purpose is improving the quality of a service or intervention by promoting adherence to standards.
- Good practice and innovative work on audit may be disseminated, including publication in appropriate journals,
Quality improvement initiatives

- Have most of the defining features of research, and share the overall purpose of systematic knowledge acquisition.
- However, the knowledge they all seek is local rather than general, and their underlying aim is to improve local services (as the audit) rather than to add to the sum of generalisable knowledge. “2P” not “3P+1G”
- Data-driven reflective practice on the part of a service manager or director
- Widespread adoption of reflective practice of this kind by clinical staff and managers should surely be encouraged as a major component of quality improvement and clinical effectiveness efforts.

Projects that do not involve set standards, but which aim to acquire knowledge about local services in order to improve those services rather than to acquire generalisable knowledge.
Electronic Health Record embedded research

Derive Evidence from Each Care Experience

Accelerate Real-World Evidence

- Promote a learning health system by fully leveraging available data
- Accelerate and give reimbursement benefit to clinical research that enlists patients as partners, takes advantage of big data, promotes data sharing and collects real-world data on care
- Support cross-disciplinary (basic, translational, clinical) and public-private partnerships (hospital, academia and industry) to develop and expand studies and to better take research to innovation
- Engage patients and families throughout the research process to better identify unmet care needs, future research priorities, and help realize better clinical outcomes.

The six components of a Learning Health System

- A **community**, which ideally will include clinicians, patients, researchers, improvement specialists, information technology specialists, managers, and policy makers.
- A **focus on outcomes**. It must produce better outcomes for patients. If it doesn't it will - and should - fold.
- A **common dataset** that is as simple as possible with data being entered only once – a **natural outgrowth** of patient care. Extra data might be collected for particular studies.
- **Quality improvement**, which reliably applies evidence generated from research when and where patients can benefit.
- **Pragmatic research** – it increases innovation and quality in real-time.
- **Governance**, which should ensure a voice for all those in the system, particularly patients.

The “gentle collision” of the worlds of quality improvement and formal research
Change practices

KNOWLEDGE  PRACTICE  BEHAVIOR  CULTURE

Change people