The Role of the Pharmacist in Optimising Patient Care, Lessons to be Learned both Clinically and Economically

Prof. Stephen Byrne
Chair in Clinical Pharmacy Practice & Head of School
Prof Stephen Byrne – Pharmaceutical Care Research Group, School of Pharmacy, University College Cork, Ireland

Co-inventor/author of STOPP/START criteria, Have received funding from the HRB and EU-FP7, EU-H2020 to investigate the impact of STOPP/START v2 in older patients

None other relevant to this talk
Internationally
Pharmacy in the 21st century

- Chronic Disease Management in Pharmacy
- Community Pharmacy and Health Screening
- Re-Categorisation of Medicines
- Pharmacist Vaccination Clinics
Future Roles

- Chronic Disease Management
- Minor Ailment Scheme
- Electronic Healthcare Records
- Health Screening
- Pharmacist Prescribing
- Extension to Vaccinations
- New Roles within Primary Healthcare Centers
Future of Pharmacy Report

Figure 11. The potential role of pharmacy in patient care across Irish healthcare settings

- Increasing cost of care setting
- Acute Care: Acute hospital care for inpatients on multiple complex medication regimes is increasingly challenging. Specialist pharmacists support both patients and prescribers to optimise medicines management.
- Residential/Formal Care: Residential/Formal care-pharmacists can contribute to the better management of patients through medication review in collaboration with patients’ GPs, reducing the level of hospital readmissions.
- Primary Care: Close interaction between pharmacist and primary care professionals can lead to a more holistic and collaborative approach to patient care, maximising patient engagement in their own care. The support offered by community pharmacies infrastructure will be critical to managing the growing level of chronic disease.
- Self Care: Population Health initiatives facilitated by pharmacists can help to negate the need for further care, as chronic illness is prevented.

- Technology: Technology will enable a more integrated approach to patient care, with improved information flow and new models of care which can enable the delivery of care closer to patients’ homes. The future role of pharmacy must adapt to these changing delivery models.
Medicines Management - Appropriate Use of Medicines

- Anti-microbials
- Coagulation
- Elderly
The older Person

- Greying population
- Exponential increase in the prevalence of diseases with increasing age
- Unique medication needs of older people
- Increased prevalence of adverse drug reactions leading to an increase in drug related morbidity and mortality
Inappropriate prescribing in the elderly:

**Potential Risk (ADR) > Potential Benefit**

- Over-prescribing
  - Dose and frequency that exceeds what is clinically indicated
- Polypharmacy:
  - Drug-drug interactions
  - Drug-disease interactions
- Under-prescribing
A Randomized, Controlled Trial of a Clinical Pharmacist Intervention to Improve Inappropriate Prescribing in Elderly Outpatients With Polypharmacy

Joseph T. Hanlon, PharmD, MS, Morris Weinberger, PhD, Gregory P. Samsa, PhD, Kenneth E. Schmader, MD, Kay M. Uttech, PharmD, Ingrid K. Lewis, PharmD, Patricia A. Cowper, PhD, Pamela B. Landsman, MPH, Harvey Jay Cohen, MD, John R. Feussner, MD, MPH, Durham, North Carolina

Effect of a Collaborative Approach on the Quality of Prescribing for Geriatric Inpatients: A Randomized, Controlled Trial

Anne Spinewine, PhD,* Christian Swine, MD,‡ Soraya Dhillon, PhD, Philippe Lambert, PhD,† Jean B. Nachega, MD, MPH, DTM&H,## Léon Wilmotte, MPharm,*,‡ and Paul M. Tulkens, MD, PhD*‡

OBJECTIVES: To evaluate the effect of pharmaceutical care provided in addition to acute Geriatric Evaluation and Management (GEM) care on the appropriateness of prescribing.

DESIGN: Randomized, controlled trial, with the patient as unit of randomization.

SETTING: Acute GEM unit.

PARTICIPANTS: Two hundred three patients aged 70 and older.

INTERVENTION: Pharmaceutical care provided from admission to discharge by a specialist clinical pharmacist who had direct contacts with the GEM team and patients.

MEASUREMENTS: Appropriateness of prescribing on admission, at discharge, and 3 months after discharge, using the Medication Appropriateness Index (MAI), Beers criteria, and Assessing Care of Vulnerable Elders (ACOVE) underuse criteria and mortality, readmission, and emergency visits up to 12 months after discharge.

RESULTS: Intervention patients were significantly more likely than control patients to have an improvement in the MAI and in the ACOVE underuse criteria from admission to discharge (odds ratio (OR) = 9.1, 95% confidence interval (CI) = 4.2–21.6 and OR = 6.1, 95% CI = 2.2–17.0, respectively). The control and intervention groups had comparable improvements in the Beers criteria.

CONCLUSION: Pharmaceutical care provided in the context of acute GEM care improved the appropriate use of medicines during the hospital stay and after discharge. This is an important finding, because only limited data exist on the effect of various strategies to improve medication use in elderly inpatients. The present approach has the potential to minimize risk and improve patient outcomes. J Am Geriatr Soc 55:658–665, 2007.

Key words: drug therapy; appropriateness; randomized controlled trial; pharmaceutical care; acute geriatric care.

Inappropriate use of medicines in elderly patients is of major concern to clinicians and public health authorities. Drug-related problems are implicated in 10% to 30% of hospital admissions in older people. Moreover, adverse drug reactions occur during hospital stays in up to half of these patients. A recent study found that 42% of elderly inpatients were prescribed at least one drug without valid indication and that dosage or duration was inadequate in about half of these patients. Conversely, medicines for conditions such as heart failure or osteoporosis remain underused in 20% to 70% of patients. Medication errors are also frequent during transition between acute and post-
A Comprehensive Pharmacist Intervention to Reduce Morbidity in Patients 80 Years or Older

A Randomized Controlled Trial

Ulrika Gillespie, MSc Pharm; Anna Alassaad, MSc Pharm; Dan Henrohn, MD, MSc, Pharm; Hans Garmo, PhD; Margareta Hammarlund-Udenaes, PhD; Henrik Toss, MD, PhD; Åsa Kettis-Lindblad, PhD; Håkan Melhus, MD, PhD; Claes Mörlin, MD, PhD

**Background:** Patients 80 years or older are underrepresented in scientific studies. The objective of this study was to investigate the effectiveness of interventions performed by ward-based pharmacists in reducing morbidity and use of hospital care among older patients.

**Methods:** A randomized controlled study of patients 80 years or older was conducted at the University Hospital of Uppsala, Uppsala, Sweden. Four hundred patients were recruited consecutively between October 1, 2005, and June 30, 2006, and were randomized to control (n=201) and intervention (n=199) groups. The interventions were performed by ward-based pharmacists. The control group received standard care without direct involvement of pharmacists at the ward level. The primary outcome measure was the frequency of hospital visits (emergency department and readmissions [total and drug-related]) during the 12-month follow-up period.

**Results:** Three hundred sixty-eight patients (182 in the intervention group and 186 in the control group) were analyzed. For the intervention group, there was a 16% reduction in all visits to the hospital (quotient, 1.88 vs 2.24; estimate, 0.84; 95% confidence interval [CI], 0.72–0.99) and a 47% reduction in visits to the emergency department (quotient, 0.35 vs 0.66; estimate, 0.53; 95% CI, 0.37–0.75). Drug-related readmissions were reduced by 80% (quotient, 0.06 vs 0.32; estimate, 0.20; 95% CI, 0.10–0.41). After inclusion of the intervention costs, the total cost per patient in the intervention group was $230 lower than that in the control group.

**Conclusion:** If implemented on a population basis, the addition of pharmacists to health care teams would lead to major reductions in morbidity and health care costs.

**Trial Registration:** clinicaltrials.gov Identifier: NCT00661310

Arch Intern Med. 2009;169(9):894-900
SYSTEMATIC REVIEW

Improving the appropriateness of prescribing in older patients: a systematic review and meta-analysis of pharmacists’ interventions in secondary care

Kieran Anthony Walsh¹,², David O’Riordan¹,², Patricia M. Kearney², Suzanne Timmons³, Stephen Byrne¹
SYSTEMATIC REVIEW

Improving the appropriateness of prescribing in older patients: a systematic review and meta-analysis of pharmacists’ interventions in secondary care

Figure 3. (a) Forest plots of comparison: summated MAI scores at discharge. (b) Change in summated MAI scores from admission to discharge.
2003: First draft of STOPP criteria
2004: First draft of START criteria
    First published abstract on STOPP
2005: First published abstract on START
    START (Screening Tool to Action Right Treatment) – a new explicit evidence based screening tool to detect prescribing omissions in elderly patients.
2006: Refinement of STOPP/START criteria
2007: First full paper on START criteria
    START (Screening Tool to Alert doctors to the Right Treatment) – an evidence based screening tool to detect prescribing omissions in elderly patients.
    Refinement of STOPP/START criteria (evidence base)
    Delphi validation of STOPP/START criteria and preparation of manuscript for publication
Potentially inappropriate prescribing in an Irish elderly population in primary care

Cristín Ryan,¹ Denis O’Mahony,² ³ Julia Kennedy,¹ Peter Weedle¹ & Stephen Byrne¹

¹Pharmaceutical Care Research Group, School of Pharmacy, ²School of Medicine, University College Cork and ³Department of Geriatric Medicine, Cork University Hospital, Cork, Ireland

WHAT IS ALREADY KNOWN ABOUT THIS SUBJECT
1. Potentially inappropriate prescribing in...
Potentially inappropriate prescribing in an Irish elderly population in primary care

Cristín Ryan, Denis O'Mahony, Julia Kennedy, Peter Weedle & Stephen Byrne

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Dr Stephen Byrne, Senior Lecturer in Clinical Pharmacy, School of Pharmacy, University College Cork, Ireland.
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Keywords
elderly patients, primary care, screening tools

Original Research Article

A Prevalence Study of Potentially Inappropriate Prescribing in Irish Long-Term Care Residents

David P. O'Sullivan · Denis O'Mahony · Carole Parsons · Carmel Hughes · Kevin Murphy · Susan Patterson · Stephen Byrne

Potentially inappropriate prescribing in older residents in Irish nursing homes

Cristín Ryan, Denis O’Mahony, Julia Kennedy, Peter Weedle, Elmarie Cottrell, Marianne Heffernan, Brid O’Mahony, Stephen Byrne

The rates of PIP calculated per cohort by STOPP

<table>
<thead>
<tr>
<th>Tool</th>
<th>No. of instances of PIP</th>
<th>No. of PIMs</th>
<th>% of PIMs</th>
<th>Mean No. of PIMs per Resident</th>
<th>No. Of Residents with PIP</th>
<th>% Residents with at least one instances of PIP</th>
</tr>
</thead>
<tbody>
<tr>
<td>STOPP</td>
<td>1280</td>
<td>1140</td>
<td>13.7%</td>
<td>1.6</td>
<td>518</td>
<td>70.8%</td>
</tr>
<tr>
<td>STOPP (Excluding as required medicines)</td>
<td>995</td>
<td>836</td>
<td>14.2%</td>
<td>1.1</td>
<td>466</td>
<td>63.7%</td>
</tr>
</tbody>
</table>
The rates of PPO calculated per cohort by START

<table>
<thead>
<tr>
<th>Tool</th>
<th>No. of instances of PPO</th>
<th>Mean No. Of PPOs per Resident</th>
<th>No. Of Residents with PIP</th>
<th>% Residents with at least one instances of PIP</th>
</tr>
</thead>
<tbody>
<tr>
<td>START</td>
<td>614</td>
<td>0.8</td>
<td>419</td>
<td>57.1%</td>
</tr>
</tbody>
</table>
Application of STOPP and START Criteria: Interrater Reliability Among Pharmacists

Cristin Ryan, Denis O’Mahony, and Stephen Byrne

The Annals of Pharmacotherapy  ■  2009 July/August, Volume 43

METHODS: Ten pharmacists (5 hospital pharmacists, 5 community pharmacists) were given 20 patient profiles containing details including age, sex, current medications, current diagnoses, relevant biochemical data, and estimated glomerular filtration rate. They applied the STOPP and START criteria to each patient profile. The PIMs and PEOs identified by each pharmacist were compared with those identified by pharmacists who were highly familiar with the application of the criteria. An interrater reliability analysis using the \( \kappa \) statistic (chance-corrected agreement) was performed to determine consistency between raters.

RESULTS: The median \( \kappa \) coefficients for hospital pharmacists compared with the academic pharmacists for STOPP were 0.88, respectively, while those for START were 0.91 and 0.94, respectively.

<table>
<thead>
<tr>
<th>Comparators</th>
<th>ppos</th>
<th>pneg</th>
<th>Median ( \kappa )</th>
</tr>
</thead>
<tbody>
<tr>
<td>STOPP</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SA</td>
<td>0.87</td>
<td>0.99</td>
<td>0.89 (0.68 to 1.0)</td>
</tr>
<tr>
<td>HPs</td>
<td>0.88</td>
<td>0.99</td>
<td>0.88 (0.67 to 1.0)</td>
</tr>
<tr>
<td>CPs</td>
<td>0.80</td>
<td>0.99</td>
<td>0.82 (0.55 to 1.0)</td>
</tr>
<tr>
<td>Inter HPs</td>
<td>0.75</td>
<td>0.99</td>
<td>0.78 (0.46 to 0.99)</td>
</tr>
<tr>
<td>Inter CPs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>START</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SA</td>
<td>0.83</td>
<td>0.99</td>
<td>0.91 (0.75 to 1.0)</td>
</tr>
<tr>
<td>HPs</td>
<td>0.87</td>
<td>0.99</td>
<td>0.90 (0.76 to 1.0)</td>
</tr>
<tr>
<td>CPs</td>
<td>0.83</td>
<td>0.99</td>
<td>0.90 (0.70 to 1.0)</td>
</tr>
<tr>
<td>Inter HPs</td>
<td>0.79</td>
<td>0.99</td>
<td>0.82 (0.57 to 0.99)</td>
</tr>
<tr>
<td>Inter CPs</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

CPs = community pharmacists; HPs = hospital pharmacists; Inter = intercomparison among pharmacists working in the same setting; PEO = potential errors of omission; PIM = potentially inappropriate medicines; pneg = proportion of negative agreement; ppos = proportion of positive agreement; SA = standard answers; START = Screening Tool to Alert doctors to Right Treatment; STOPP = Screening Tool of Older Peoples’ Prescriptions.
• 26.3% of Admission due to ADEs
• 10.9% the prime cause of hospital admission
• 55.6% significantly contributed to hospital admission
• 51.7% were listed in STOPP (OR = 1.83; 95% CI 1.49 – 2.24; p < 0.001)
The Impact of a Structured Pharmacist Intervention on the Appropriateness of Prescribing in Older Hospitalized Patients

David O’Sullivan · Denis O’Mahony · Marie N. O’Connor · Paul Gallagher · Shane Cullinan · Richard O’Sullivan · James Gallagher · Joseph Eustace · Stephen Byrne

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Abstract

Background Throughout the literature, drug-related problems (DRPs), such as medication reconciliation issues and potentially inappropriate prescribing, have been reported to be associated with adverse outcomes in older individuals. Both structured pharmacist review of medication (SPRM) interventions and computerized decision support systems (CDSSs) have been shown to reduce DRPs.

Objective The objectives of this study were to (i) evaluate the impact of a specially developed SPRM/CDSS intervention on the appropriateness of prescribing in older Irish hospital inpatients, and (ii) examine the acceptance rates of these recommendations.

Methods We prospectively reviewed 361 patients, aged ≥65 years who were admitted to an Irish university teaching hospital over a 12-month period. At the point of admission, the patients received a SPRM/CDSS intervention, which screened for DRPs. Any DRPs that were identified were then communicated in writing to the attending medical team. The patient’s medical records were reviewed again at 7–10 days, or at the point of discharge (whichever came first).

Results Of the 361 patients reviewed, 181 (50.1%) were female; the median age was 77 years (interquartile range [IQR] 71–83 years). A total of 3,153 (median 9, IQR 5–12) and 4,192 (median 12, IQR 8–15) medications were prescribed at admission and discharge, respectively. The SPRM generated 1,000 recommendations in 296 patients. Of the 1,000 recommendations, 548 (54.8%) were implemented by the medical teams accordingly. The SPRM/CDSS intervention resulted in an improvement in the appropriateness of prescribing as defined by the medication appropriateness index (MAI), with a statistically significant difference in the median summed MAI at admission (15, IQR 7–21) and follow-up (12, IQR 6–18), p < 0.001. However, the SPRM did not result in an improvement in appropriateness of underprescribing as defined by a modified act assessment of care of vulnerable elders (ACOVE) criteria.

Conclusion This study indicated that DRPs are prevalent in older Irish hospitalized inpatients and that a specially developed SPRM intervention supported by a CDSS can improve both the appropriateness and accuracy of medication regimens of older hospitalized inpatients.

1 Introduction

Older individuals aged ≥65 years constitute approximately 12% of the Irish population, with this figure expected to almost double by 2045 [1]. During the same period the
The Impact of a Structured Pharmacist Intervention on the appropriateness of prescribing in Older Hospitalised Patients

Objectives

• Evaluate the impact of a SPRM care intervention using CDSS on the appropriateness of prescribing in older Irish hospitalised inpatients.

• We prospectively studied 361 patients, aged ≥65 years who were admitted to an Irish University Teaching Hospital over a 13 month period.

O’Sullivan David, PhD Thesis 2014 – under review
Outcomes

Primary outcome

• Appropriateness of prescribing as defined by the medication appropriateness index (MAI) and a modified subset of the ACOVE criteria.

Secondary outcome

• Uptake and acceptance of interventions by the hospital physicians.

• The prevalence of PIP as defined by STOPP, Beers 2003 and Priscus criteria, and the combined PIP at admission and follow-up.

O’Sullivan David, PhD Thesis 2014
• 1,000 medicines reconciliations issues were identified in 296 (82.0%) patients.

• 54.8% (n=548) of the pharmacists recommendations were accepted.

O’Sullivan David, PhD Thesis 2014, UCC
# Breakdown of Medicines Reconciliations

<table>
<thead>
<tr>
<th>Type of Recommendations</th>
<th>No. of Recommendations</th>
<th>Recommendations accepted N (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Appropriateness Issues</strong></td>
<td>577</td>
<td>222 (38.5%)</td>
</tr>
<tr>
<td>• Indication</td>
<td>47</td>
<td>18 (38.3%)</td>
</tr>
<tr>
<td>• Interactions</td>
<td>73</td>
<td>29 (39.7%)</td>
</tr>
<tr>
<td>• Renal Adjustment</td>
<td>25</td>
<td>13 (52%)</td>
</tr>
<tr>
<td>• Appropriateness Tools (STOPT, Beers, PRISCUS, START criteria)</td>
<td>297</td>
<td>135 (45.5%)</td>
</tr>
<tr>
<td>• Underprescribing assessment tool (START criteria)</td>
<td>44</td>
<td>13 (29.5%)</td>
</tr>
<tr>
<td>• Miscellaneous Appropriateness Issues</td>
<td>91</td>
<td>27 (29.7%)</td>
</tr>
<tr>
<td><strong>Reconciliation Issues</strong></td>
<td>423</td>
<td>326 (77.1%)</td>
</tr>
<tr>
<td>• Dosage</td>
<td>95</td>
<td>69 (72.6%)</td>
</tr>
<tr>
<td>• Missing Medications</td>
<td>322</td>
<td>252 (78.3%)</td>
</tr>
<tr>
<td>• Miscellaneous Reconciliation Issues</td>
<td>6</td>
<td>5 (83.3%)</td>
</tr>
</tbody>
</table>

O’Sullivan David, PhD Thesis 2014 – under review
### Medication Appropriateness

<table>
<thead>
<tr>
<th></th>
<th>Admission</th>
<th>Follow-up</th>
<th>Significance (p)*</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Median MAI score for medications (IQR)</strong></td>
<td>15 (7-21)</td>
<td>12 (6-18)</td>
<td>0.000</td>
</tr>
<tr>
<td><strong>Median MAI score for regular medications (IQR)</strong></td>
<td>13 (6-20)</td>
<td>9 (4-16)</td>
<td>0.000</td>
</tr>
<tr>
<td><strong>Median MAI score for “prn” medications (IQR)</strong></td>
<td>0 (0-1)</td>
<td>1 (0-3)</td>
<td>0.000</td>
</tr>
</tbody>
</table>

- IQR: interquartile range, *PRN: pro re nata* (‘when required’)
- *Wilcoxon Signed Rank Test

O’Sullivan David, PhD Thesis 2014 – under review
Prevention of Adverse Drug Reactions in Hospitalised Older Patients Using a Software-Supported Structured Pharmacist Intervention: A Cluster Randomised Controlled Trial

David O’Sullivan1 · Denis O’Mahony2,3 · Marie N. O’Connor2 · Paul Gallagher2,3 · James Gallagher1 · Shane Cullinan1 · Richard O’Sullivan1 · Joseph Eustace1 · Stephen Byrne1,2

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Abstract

Background Proven interventions to reduce adverse drug reactions (ADRs) in older hospitalised patients are lacking. Previous randomised controlled trial (RCT) data indicate that a structured pharmacist review of medication (SPRM) can reduce inappropriate prescribing in older hospitalised patients. However, no RCT data show that an SPRM reduces ADRs in this population.

Methods We performed a cluster RCT comparing a clinical decision support software (CDSS)-supported SPRM intervention with standard pharmaceutical care in older patients hospitalised with an acute unselected illness. Over 13 months, we screened 1833 patients aged ≥65 years admitted to specialist services other than geriatric medicine for study inclusion. We randomised 361 patients to the trial intervention arm and 376 patients to the control arm, applying the intervention at a single timepoint within 48 h of admission. The primary endpoint (ADR incidence) was assessed at 7–10 days post-admission or at discharge (whichever came first). The secondary endpoints were the median hospital length of stay (LOS) and hospital mortality rate.

Results Attending clinicians in the intervention group implemented 54.8 % of SPRM/CDSS prescribing recommendations. Ninety-one ADRs occurred in 78 control patients (20.7 %) compared with 61 ADRs in 50 intervention patients (13.9 %), i.e., an absolute risk reduction of 6.8 %. The number needed to treat (NNT) to prevent one patient having one ADR was 15; the total NNT to prevent one ADR was 14. The median LOS and hospital mortality were not significantly different.

Conclusion An SPRM delivered on a CDSS platform significantly reduces ADR incidence in acutely hospitalised older people.

Key Points

This study demonstrated the ability of a clinical pharmacy medication review supported by computerized clinical decision support software to reduce adverse drug reactions (ADRs) amongst older patients.

An ADR trigger list proved to be very effective in the identification of serious and non-trivial ADRs amongst older patients.

Pharmacists have the potential to reduce the occurrence of in-hospital ADRs and optimise prescribing for older patients.

1 Introduction

Adverse drug reactions (ADRs) represent a major public health problem in the globally expanding older population [1–5]. Multi-morbidity illness and associated polypharmacy,
Prevention of ADRs in hospitalised older patients using a CDSS/SPRM intervention: a cluster RCT.

O’Sullivan David, PhD Thesis 2014, UCC
Primary outcome:
The proportion of patients in either group who experienced a non-trivial ADR during their hospital stay.

Secondary outcomes:
• Median hospital LOS (in days).
• Hospital mortality rate.

O’Sullivan David, PhD Thesis 2014, UCC
Intervention patients

- 61 ADRs occurred in 50 patients (13.9%).
  - 33 ADRs as ‘probable’
  - 28 ADRs as ‘possible’

- 31 were classified as definitely avoidable
- 23 as possibly avoidable
- 7 as unavoidable

Control patients

- 91 ADRs were recorded in 78 patients (20.7%).
  - 1 was defined as certain,
  - 65 were deemed probable
  - 25 were deemed possible.

- 62 were classified as definitely avoidable,
- 20 possibly avoidable and
- 9 unavoidable

O’Sullivan David, PhD Thesis 2014, UCC
Primary Outcomes

• There was a statistically significant difference in ADR incidence between the two groups,
  • 13.9% in the intervention group versus 20.7% in the control group (p< 0.001),
• An ADR absolute risk reduction of 6.8 % (95% CI, 1.5%-12.3%)

• A relative ADR risk reduction of 33.3% (95% CI, 7.7-51.7).

• The number of patients needed to screen with the intervention to avoid one ADR was 15 (95% CI, 8-68).

O’Sullivan David, PhD Thesis 2014, UCC
Secondary Outcomes

• There was no significant difference in the median length of stay of the two groups:
  • 9 days (5-16) versus 8 days (5-13.5); p=0.444.

• There was no significant difference found in all-cause mortality rate between the two groups;
  • 17 patients (4.7%) versus 17 (4.5%) patients.

O’Sullivan David, PhD Thesis 2014, UCC
Structured Pharmacist Review of Medication in Older Hospitalised Patients: A Cost-Effectiveness Analysis

James Gallagher¹ · David O’Sullivan¹ · Suzanne McCarthy¹ · Paddy Gillespie² · Noel Woods³ · Denis O’Mahony⁴,⁵ · Stephen Byrne¹


Cost-outcome description of clinical pharmacist interventions in a university teaching hospital

James Gallagher¹,⁴*, Stephen Byrne¹, Noel Woods², Deirdre Lynch³ and Suzanne McCarthy¹

BMC Health Serv Res. 2014 Apr 17;14:177.
Method – Trial data

- Trial based evaluation
- June 2011 – June 2012
- CHEERS guidelines [2]
- Healthcare payer perspective
- Analysis on intention to treat basis
<table>
<thead>
<tr>
<th>Cost Component</th>
<th>Description</th>
<th>Unit Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pharmacist</td>
<td>Per application of SPRM/CDSS</td>
<td>€40</td>
</tr>
<tr>
<td>Non-consultant hospital doctor</td>
<td>Per review of pharmaceutical care plan</td>
<td>€5.06</td>
</tr>
<tr>
<td>Inpatient day</td>
<td>Cost of care per hospital in patient day</td>
<td>€850</td>
</tr>
<tr>
<td>Software costs</td>
<td>One off installation of software programme</td>
<td>€1000</td>
</tr>
</tbody>
</table>
Method – Cost effectiveness analysis

• Outcome – Incremental cost-effectiveness ratio (ICER)

• $\text{ICER} = \frac{\text{Difference in costs between programmes } P1 \text{ and } P2}{\text{Difference in health effects between programmes } P1 \text{ and } P2}$

• Incremental analysis – Multi-level mixed effect regression models

• Uncertainty – Cost-effectiveness acceptability curves
### Outcomes

<table>
<thead>
<tr>
<th></th>
<th>INTERVENTION (N = 361)</th>
<th>CONTROL (N = 376)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>COST ANALYSIS</strong></td>
<td>Mean (SD)</td>
<td>Mean (SD)</td>
</tr>
<tr>
<td>Total Cost (€)</td>
<td>13242 (15530)</td>
<td>15465 (19310)</td>
</tr>
<tr>
<td><strong>EFFECTIVENESS ANALYSIS</strong></td>
<td>N (%)</td>
<td>N (%)</td>
</tr>
<tr>
<td>ADR Event</td>
<td>50 (13.85)</td>
<td>78 (20.74)</td>
</tr>
<tr>
<td><strong>No. of ADR Events</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>311 (86.15)</td>
<td>298 (79.26)</td>
</tr>
<tr>
<td>1</td>
<td>40 (11.08)</td>
<td>65 (17.29)</td>
</tr>
<tr>
<td>2</td>
<td>9 (2.49)</td>
<td>12 (3.46)</td>
</tr>
<tr>
<td>3</td>
<td>1 (0.28)</td>
<td>0 (0.00)</td>
</tr>
<tr>
<td>Mean (SD)</td>
<td>0.169 (0.456)</td>
<td>0.242 (0.503)</td>
</tr>
</tbody>
</table>
## Outcomes

<table>
<thead>
<tr>
<th>Incremental Analysis</th>
<th>Intervention versus Control</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Incremental Cost:</strong></td>
<td></td>
</tr>
<tr>
<td>Mean cost difference</td>
<td>-815</td>
</tr>
<tr>
<td>(95% CI’s) (p-value)</td>
<td>(-3451, 1820) (0.544)</td>
</tr>
<tr>
<td><strong>Incremental Effect:</strong></td>
<td></td>
</tr>
<tr>
<td>ADR Event Odds Ratio</td>
<td>0.655</td>
</tr>
<tr>
<td>(95% CI’s) (p-value)</td>
<td>(0.431, 0.994) (0.047)</td>
</tr>
<tr>
<td><strong>Incremental Effect:</strong></td>
<td></td>
</tr>
<tr>
<td>No. of ADR Events</td>
<td>-0.064</td>
</tr>
<tr>
<td>Difference in Mean</td>
<td>(-0.135, 0.008) (0.081)</td>
</tr>
<tr>
<td>(95% CI’s) (p-value)</td>
<td></td>
</tr>
</tbody>
</table>
Cost-effectiveness Plane

Cost-effective....depending on threshold
Incremental cost-effectiveness ratio of SPRM/CDSS

Difference in costs

Difference in effects

€5,000
€4,000
€3,000
€2,000
€1,000
0
(-€1,000)
(-€2,000)
(-€3,000)
(-€4,000)
(-€5,000)
Guidelines For Antimicrobial Prescribing In Primary Care In Ireland

November 2011
A cross-sectional survey of the profile and activities of Antimicrobial Management Teams in Irish Hospitals

Aoife Fleming · Antonella Tonna · Sile O’Connor · Stephen Byrne · Derek Stewart

Background

• Best practice recommends a multidisciplinary Antimicrobial Management Team (AMT) to conduct Antimicrobial Stewardship (AMS) in hospitals.

• Important to compare performance to other countries.

• Donabedian Framework:

  Structure → Process → Outcome
The aim was to compare the profile of AMT membership & the AMS activities between Ireland & the United Kingdom.

- Conduct a nationwide survey of Irish hospitals
- Conduct a nationwide survey of UK hospitals

➤ Compare the findings
Methods

• Ethical approval obtained.
• Self-completion postal questionnaire developed & piloted in the UK, 2 reminders.
• Irish survey: issued Mar-Apr 2012 to all hospital Antimicrobial Pharmacists or Chief Pharmacist.
• UK survey: issued Nov 2011 – Jan 2012 to all NHS hospital Antimicrobial Pharmacists
• Results analysed & published independently.
• Comparison conducted using Chi squared tests for categorical variables; \( p < 0.05 \) significant.
Results

• Response rates:
  • 73% (n=51) Ireland (15 private, 36 public)
  • 33% (n=273) UK (all NHS)

• 57% (29/51) have an AMT in Ireland.
• 82% (186/226) have an AMT in the UK.

• Majority of hospitals have Antimicrobial prescribing Policy (88% Irl, 98% UK).
## Results: Antimicrobial Management Team

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Ireland</th>
<th>UK</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Antimicrobial Management Team (AMT)</td>
<td>57% (29/51)</td>
<td>82% (186/273)</td>
<td>&lt; 0.001*</td>
</tr>
<tr>
<td>Antimicrobial prescribing policy</td>
<td>88% (45/51)</td>
<td>98% (222/226)</td>
<td>= 0.001*</td>
</tr>
<tr>
<td>Antimicrobial Pharmacist on the AMT</td>
<td>69% (20/29)</td>
<td>95% (177/186)</td>
<td>&lt; 0.001*</td>
</tr>
<tr>
<td>Consultant Infectious Diseases on the AMT</td>
<td>24% (7/29)</td>
<td>67% (97/145)</td>
<td>&lt; 0.001*</td>
</tr>
</tbody>
</table>
## Results: Antimicrobial Stewardship activities

<table>
<thead>
<tr>
<th>Activity</th>
<th>Ireland</th>
<th>UK</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Audit volume of antibiotic prescribing</td>
<td>86% (36/42)</td>
<td>73% (162/222)</td>
<td>= 0.057</td>
</tr>
<tr>
<td>Audit appropriateness of antibiotic prescribing</td>
<td>58% (24/41)</td>
<td>76% (169/222)</td>
<td>= 0.019*</td>
</tr>
<tr>
<td>Audit appropriateness of restricted antibiotic prescribing</td>
<td>52% (22/42)</td>
<td>64% (143/222)</td>
<td>= 0.140</td>
</tr>
</tbody>
</table>

Irish Public hospitals more likely to audit volume of antibiotic prescribing ($p = 0.021$) & appropriateness of restricted antibiotic prescribing ($p = 0.003$) than Private hospitals.
## Results: Feedback to prescribers

<table>
<thead>
<tr>
<th>Feedback</th>
<th>Ireland</th>
<th>UK</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Antimicrobial resistance</td>
<td>33% (17/51)</td>
<td>29% (66/226)</td>
<td>0.56</td>
</tr>
<tr>
<td>Antimicrobial prescribing to ward teams</td>
<td>29% (15/51)</td>
<td>62% (138/222)</td>
<td>&lt; 0.001*</td>
</tr>
<tr>
<td>Antimicrobial prescribing to individual doctors</td>
<td>25% (13/51)</td>
<td>33% (74/222)</td>
<td>0.278</td>
</tr>
<tr>
<td>Comparing institutions</td>
<td>24% (12/51)</td>
<td>24% (53/222)</td>
<td>-</td>
</tr>
</tbody>
</table>
Aims of policy similar:
- Promote appropriate prescribing, narrow spectrum, microbiological investigation, reduce MDR infections.

Content of policy largely similar:
- Empirical prescribing, surgical prophylaxis, gentamicin protocol.
- Irish hospitals more likely to have surgical prophylaxis included (p = 0.014).
- UK hospitals more likely to have automatic stop orders for restricted antibiotics (p < 0.001).
Results: Key strategic issues UK

“Locally we need to finalise guidelines and then begin to develop our audit and feedback processes.”

Process issues

“Electronic prescribing would make monitoring much easier, and feedback immediate and effective in changing prescribing patterns”

(SHA = Strategic Healthcare Authority, DoH = Department of Health)
“Despite repeated attempts to put an Antimicrobial Stewardship team in place it has not happened. We need a Microbiologist to push things forward.”

“It will be difficult to progress without ring-fencing of resources needed to implement and develop antibiotic programmes.”

Results: Key strategic issues Ireland

Structure & Process issues
Discussion

• Important differences found between Ireland & UK.
  • Due to lower numbers of antimicrobial pharmacists on Irish AMTs?
  • Lack of resources dedicated to AMS? Economic impact?
• Only some of the SARI & HIQA guidelines have come to fruition.
• Impact of Antimicrobial Pharmacists has been shown: a €3 return for every €1 spent on salary (IAPG 2010).
Implications for practice

- Continuous support for antimicrobial pharmacists & audit activities essential
- Improve reporting on Antimicrobial Resistance.
- Improve feedback to teams & doctors.
- Regulation: will the inspection of hospitals against the Infection Prevention & Control Standards (HIQA) lead to change?
- Future research must investigate in greater detail the Outcomes of AMT & AMS.
References


• SARI Hospital antimicrobial stewardship working group. Guidelines for antimicrobial stewardship in hospitals in Ireland 2009.


Eye on the patient benefit prize
Too much of a good thing can be bad for you.
Thank You!

stephen.byrne@ucc.ie
References


Gallagher P., Ryan C., Byrne S., Kennedy J. and O'Mahony D. STOPP (Screening Tool of Older Persons’ potentially inappropriate Prescriptions) and START (Screening Tool to Alert doctors to Right i.e. appropriate, indicated Treatment). Validation of new criteria for inappropriate prescribing in the elderly. International Journal of Clinical Pharmacology and Therapeutics 2008; Vol. 46 No. 2: 72-83


Medication Optimisation in Older People

- Structured pharmacist intervention & feedback to prescribers
- Routine monitoring of high-risk patients, e.g. polypharmacy, (as with anticoagulation, Diabetes)
- STOPP/START criteria
- Structured monitoring for ADE’s in hospital and community
- Cost containment: Best value drug selection
- Patient education, information
- Compliance enhancement techniques
- Electronic prescribing, mandatory audit of prescribing practice
- Mandatory undergraduate, postgraduate education in Geriatric Therapeutics
- Medication Use Review by pharmacist with full access to patients’ electronic medical records
- Clear, overtly documented therapeutic targets

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UCC