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Did a physician-targeted intervention that reduced potentially inappropriate prescribing to elderly patients also reduce related hospitalizations?

Jacquelyn McRae, PharmD
Jefferson College of Population Health, Thomas Jefferson University

Sarah E. Hegarty, PharmD
Department of Pharmacology and Experimental Therapeutics, Thomas Jefferson University

M. Alcusky
Jefferson College of Population Health, Thomas Jefferson University

A. Vegesna
Jefferson College of Population Health, Thomas Jefferson University

S. Varga
Jefferson College of Population Health, Thomas Jefferson University

See next page for additional authors

Authors

Jacquelyn McRae, PharmD; Sarah E. Hegarty, PharmD; M. Alcusky; A. Vegesna; S. Varga; S. W. Keith; S. Del Canale; M. Lombardi; and Vittorio Maio, PharmD, MSPH

Did a physician-targeted intervention that reduced potentially inappropriate prescribing to elderly patients also reduce related hospitalizations?

McRae JM[1], Hegarty S[2], Alcusky M[1], Vegesna A[1], M, Varga S[1],Keith SW[2], Del Canale S[3], Lombardi M[3], Maio V[1]

1. Jefferson College of Population Health, Thomas Jefferson University, Philadelphia PA
2. Division of Biostatistics, Department of Pharmacology and Experimental Therapeutics, Thomas Jefferson University, Philadelphia PA
3. Parma Local Health Authority, Parma Italy

INTRODUCTION

- A potentially inappropriate medication (PIM) is a drug that may be inappropriate because the risks outweigh the potential benefits.[1]
- PIM use in the elderly can be especially harmful due to less effective clearance systems, frail bodies, and polypharmacy.[2,3]
- Maio and colleagues estimated that approximately 20% of elderly Emilia-Romagna residents were prescribed a PIM in 2006.[4]
- A retrospective, longitudinal analysis of over 1.4 million elderly, Emilia-Romagna residents (2003-2013) demonstrated that individuals exposed to a PIM were 16% more likely to be hospitalized than persons unexposed to PIM.[5]
- Evidence of the clinical effectiveness of interventions aimed at reducing PIM prescribing in the elderly is limited and has yielded mixed results.[6]

OBJECTIVES

To determine whether a general practitioner focused intervention aimed at decreasing PIM prescribing in the elderly can decrease the risk of PIM-related hospitalizations.

METHODS

This study was reviewed by the Thomas Jefferson University IRB and determined not to constitute human subjects research.

Intervention

- Implemented over a 2 year time period: 2008-2009.[7]
- Serving residents of the Local Health Authority (LHA) of Parma, Emilia-Romagna region (RER), Italy, one of the 11 regional LHAs.
- Aimed to engage 303 general practitioners (GPs) on PIM awareness in the elderly population.
- The three components of the intervention included:
    1. Circulation of a developed list of PIM to “always be avoided” and a list of alternatives.
    2. Annual reviews of incidence of PIM use in the elderly.
    3. Educational sessions on PIM use (academic, case reviews).

Comparators

- We evaluated the effectiveness of the physician-directed PIM intervention by comparing the risk of PIM-related hospitalizations for residents under the care of a general practitioner (GP) in Parma LHA during and after intervention (post-intervention, 1/1/2008-9/30/2011) to residents under the care of a GP in the rest of the RER (Non-Parma).

Study Population

- Study time period: 01/01/2005 – 09/30/2011.
- Elderly individuals (≥65 years old) who were residents of RER for at least one year were included in the cohort.
- Individuals exited the cohort at the earliest time they met one of the following criteria: death, moved out of the region, or hospitalization for more than 30 consecutive days.

Modeling

- We developed a time-dependent covariate, repeated-events, Cox Proportional Hazard Model using fully-linked longitudinal administrative claims from the RER database.
- Event of interest: PIM-related hospitalizations, defined as an unplanned, inpatient hospitalization occurring during PIM exposure.
    - Defined PIM: Drugs that should be “always be avoided”, according to the 2007 Maio Criteria.[8]
    - To estimate PIM exposure we computed the number of days supplied for each medication of interest (using Defined Daily Doses) and added 30 days to capture any residual effects of a PIM. An individual was considered exposed to PIM from the date the prescription was filled until 30 days after the prescription was expected to end based on DDD.
    - Adjustments for the outcome included: age, gender, number of non-PIM hospitalizations (in the previous four quarters), number of chronic condition drug groups (CCDGs) (in the previous four quarters).[9]

Calculations

- Demographics were summarized for Parma and Non-Parma at the start of the intervention (01/01/2008).
- Unadjusted PIM exposure and PIM related-hospitalizations were estimated for Parma vs. Non-Parma residents.
- We used Cox modeling to estimate adjusted hazard ratios (HRs) of PIM-related hospitalizations for Parma post vs. pre-intervention.
- We calculated the number of PIM-related hospitalizations avoided in Parma post-intervention vs. pre-intervention (Figure 1).

Figure 1. Equations for Hospitalizations Avoided

$$Preventable\ Fraction = 1 - HR$$

$$\mathrm{HR} = \text{HR from Cox model for interaction between period (pre vs. post) and location (Parma vs. not)}$$

$$\#\mathrm{Expectedhosp} = \frac{\#\mathrm{Observedhosp}}{1 - \text{preventable fraction}} \qquad \#\mathrm{Avoidedhosp} = \#\ \mathrm{Expectedhosp} - \#\ \mathrm{Observedhosp}$$

RESULTS

Demographics

- When the intervention was introduced in 2008, there were 906,810 elderly residents in the Emilia-Romagna region and approximately 1/10th were under the care of a Parma GP.
- The exposure to PIM, previous hospitalizations, and comorbid status, gender, and age strata of residents in Parma and Non-Parma were similar.

Data for this study was retrieved from the Regional database of the Emilia-Romagna Region, provided through a collaborative agreement between the Health Care Authority, Regione Emilia-Romagna, Italy, and Thomas Jefferson University.

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RESULTS

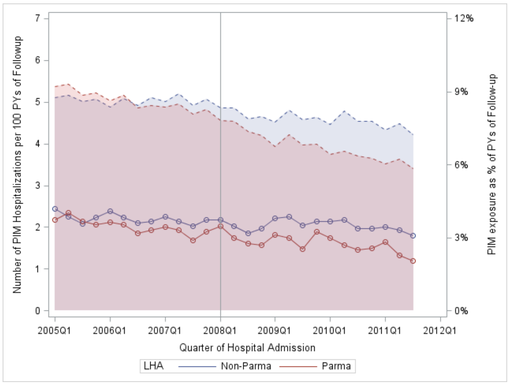
Table 1. Demographics, 2008

	All		Non-Parma, n(%)	Parma, n(%)
	N	%		
No. Patients	906,810	100%	816,325 (100%)	90,485 (100%)
Exposed to PIM (yes)	76,070	8.4%	68,798 (8.4%)	7,272 (8.0%)
Female	522,895	57.7%	470,132 (57.6%)	52,763 (58.3%)
Age				
65-74 years	459,946	50.7%	414,590 (50.8%)	45,356 (50.1%)
75- 84 years	328,065	36.2%	295,318 (36.2%)	32,747 (36.2%)
>84 years	118,799	13.1%	106,417 (13.0%)	12,382 (13.7%)
Hospitalizations, 2007				
0	757,427	83.5%	681,609 (83.5%)	75,818 (83.8%)
1-2	134,989	14.9%	121,658 (14.9%)	13,331 (14.7%)
3-4	12,207	1.3%	11,043 (1.4%)	1,164 (1.3%)
5+	2,187	0.2%	2,015 (0.2%)	172 (0.2%)
CCDGs, 2007				
0	53,241	5.9%	47,367 (5.8%)	5,874 (6.5%)
1-2	378,357	41.7%	339,836 (41.6%)	38,521 (42.6%)
3-4	334,820	36.9%	302,291 (37.0%)	32,529 (35.9%)
5+	140,392	15.5%	126,831 (15.5%)	13,561 (15.0%)

PIM Exposure & Hospitalizations

- In 2005, residents of Parma and Non-Parma were exposed to approximately 8 person years (PYs) of PIM per 100 PYs follow-up time (Figure 2).
- Post-intervention, we observed a decrease in exposure to PIM, appearing a more drastic decline in Parma than Non-Parma.
- Post-intervention there appears to be a decline in PIM-related hospitalizations in Parma consistent with the decline in PIM-exposure (post-intervention).

Figure 2. Parma vs. Non-Parma Trends, 2005-2011



Hazard Ratios

- Compared with others in the RER during the same periods, Parma residents post-intervention were 7% less likely to have a PIM-related hospitalization than pre-intervention (Table 2).
- We estimated that approximately 411 PIM-related hospitalizations were avoided due to the intervention.

Table 2. Cox Model Results

	HR (95% CI)	P value
Post- vs. Pre- Intervention	0.93 (0.89, 0.97)	0.002
Female	0.90 (0.89, 0.91)	<0.001
Age	1.08 (1.08, 1.08)	<0.001
1+ CCDG	1.50 (1.50, 1.51)	<0.001
1+ hospitalization	1.23 (1.23, 1.24)	<0.001

LIMITATIONS

- The RER database does not include inpatient medications (potential underestimation of PIM exposure).
- Although adjusted for available confounders, causality of hospitalizations is unknown.

CONCLUSIONS

- Approximately 411 PIM-related hospitalizations were avoided in Parma LHA and elderly residents during post-intervention were at significantly lower risks of PIM-related hospitalizations than pre-intervention.
- We believe that the observed decline in PIM-hospitalizations within Parma LHA was attributable to the decreased exposure to PIMs.
- To our knowledge this is the first study to evaluate the effectiveness of a multi-year, PIM awareness program with respect to incident hospitalizations.
- We believe that the observed decreased risk of PIM-related hospitalizations in Parma LHA post-intervention was due to changes in physician behavior.
- We urge researchers to continue to evaluate the effectiveness of interventions targeted at increasing awareness of the potential harms of PIM in the elderly.

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