

Medicines Intelligence in Scotland: Informing Policy and Driving Improvement in Patient Care

International EBHC Symposium Oct 2021

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Outline

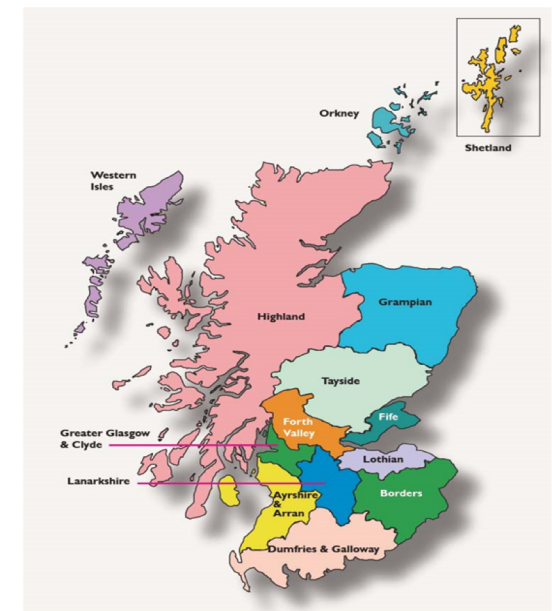
- Medicines in healthcare
 - Policy
 - Healthcare delivery (use and harm)
- Scotland's medicines surveillance capabilities in action
 - Case exemplars

Globally

- Medicines third largest health system cost, after inpatient & outpatient costs
 - ~ 16% in OECD countries
 - ~ 23-30% in low/medium income countries
- Medicines can cause harm
 - 1 in 20 hospital admissions
 - ~ 50% preventable

Scotland

- 5.4 million population
- 14 Health Boards
- Medicine expenditure
 - NHS Scotland 2020 – £1.8 billion
 - Primary care - £1.1 billion (61%)
 - Secondary care - £0.7 billion



Safer Use of Medicines



1 in 5

adults in Scotland are dispensed 5 or more medicines

59% of patients over 70 years old are dispensed 5 or more medicines

Each year in primary care



101 million

prescription items are issued in primary care

4 million prescribing errors

40,000 to 3.4 million dispensing errors



61,000

non-elective hospital admissions are due to medicines

5 classes of medicines account for most admissions

- NSAIDs
- Antiplatelets
- Anticoagulants
- Diuretics
- Anti-hypertensives

Each year in acute care



435,000 inpatient prescription

items are prescribed in an average 500 bed acute hospital

32,500 prescribing errors with **up to 200** causing patient harm

35 to 85 dispensing errors



2 million

doses of medicines administered in an average 500 bed acute hospital

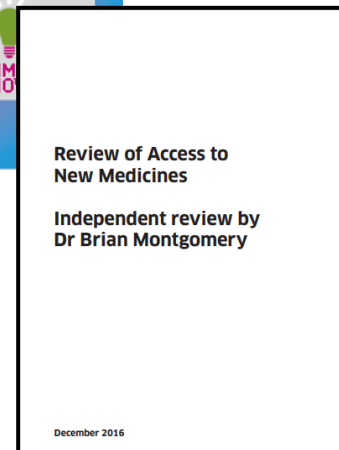
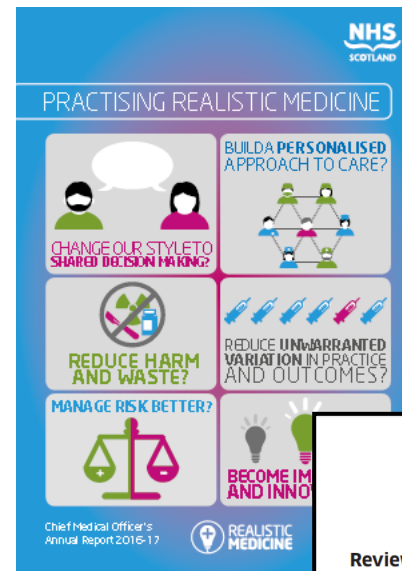
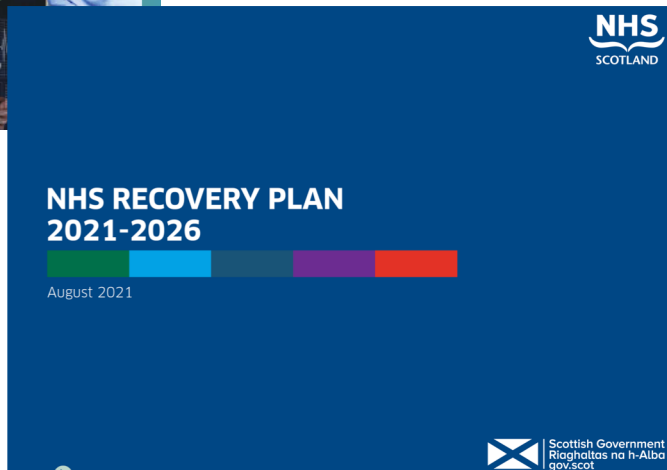
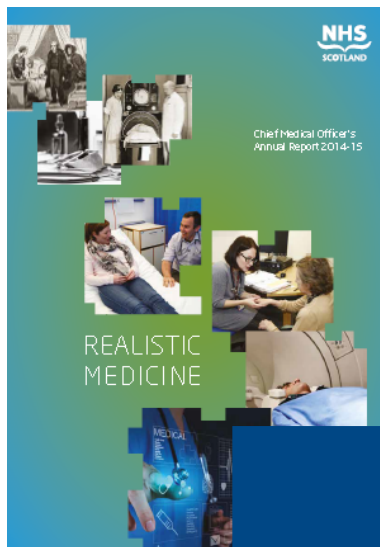
189,000 administration errors



15,000 patients admitted to all acute hospitals experience an adverse event due to medicines

up to 280 preventable deaths across all acute hospitals are due to medicines

Health / Medicines Policy in Scotland



Medicines Programs

- High Risk Medicines
- Antimicrobial Stewardship +
- Cancer Medicines
- COVID related
 - COVID medicines treatment in our hospitals
 - Vaccination surveillance
 - Impact on routine care - medicines*
- Medicines in Pregnancy (Sodium Valproate)

* <https://www.publichealthscotland.scot/our-areas-of-work/covid-19/covid-19-data-and-intelligence/covid-19-wider-impacts-to-the-health-care-system/>

+ Bennie M, Malcolm W, Marwick CA, Kavanagh K, Sneddon J, Nathwani D. Building a national infection intelligence platform to improve antimicrobial stewardship and drive better patient outcomes: the Scottish experience. J Antimicrob Chemother. 2017;72(10):2938-2942.

High Risk Medicines (Primary / Community Care)

- Driving improvement in patient care
- Safer Use of high-risk medicines through data-driven quality improvement

Building Medicines Surveillance capabilities in community/ primary care

Int. J. Epidemiol. Advance Access published May 10, 2016



International Journal of Epidemiology, 2016, 1–8
doi: 10.1093/ije/dyv080
DATA RESOURCE PROFILE



International Journal of Epidemiology, 2018, 1–8
doi: 10.1093/ije/dyx264
Original article



DATA RESOURCE PROFILE

Data Resource Profile: The Scottish National Prescribing Information System (PIS)

Samantha Alvarez-Madrado,¹ Stuart McTaggart,² Clifford Nangle,² Elizabeth Nicholson² and Marion Bennie^{1,2,*}

¹Strathclyde Institute of Pharmacy and Biomedical Sciences, University of Strathclyde, Glasgow, UK and ²Public Health and Intelligence Strategic Business Unit, NHS National Services Scotland, Edinburgh, UK

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Accepted 3 March 2016

Data resource basics

The Prescribing Information System (PIS) provides an infrastructure for pharmacoepidemiology and pharmacovigilance research, attracting growing attention due to its unique combination of characteristics. Compared with several databases worldwide offering nation coverage and record linkage,^{1–3} PIS National Health Service (NHS) prescriber dispensed and reimbursed within the community covering in Scotland a total population of 5.3 million residents.

Data resources and population coverage

PIS holds information for over 1.6 billion prescriber reimbursed in the community from January 1993 to 2014 over 507 million items prescribed and over 344 million items dispensed from 2009 to 2014.⁷ The CHI cap

Original article

Use of text-mining methods to improve efficiency in the calculation of drug exposure to support pharmacoepidemiology studies

Stuart McTaggart,¹ Clifford Nangle,^{1,4} Jacqueline Caldwell,^{1,4} Samantha Alvarez-Madrado,^{2,4} Helen Colhoun^{3,4} and Marion Bennie^{1,2,4,*}

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Editorial decision 22 November 2017; Accepted 11 December 2017

Abstract

Background: Efficient generation of structured data instructions that enable researchers



REVIEW | Free Access

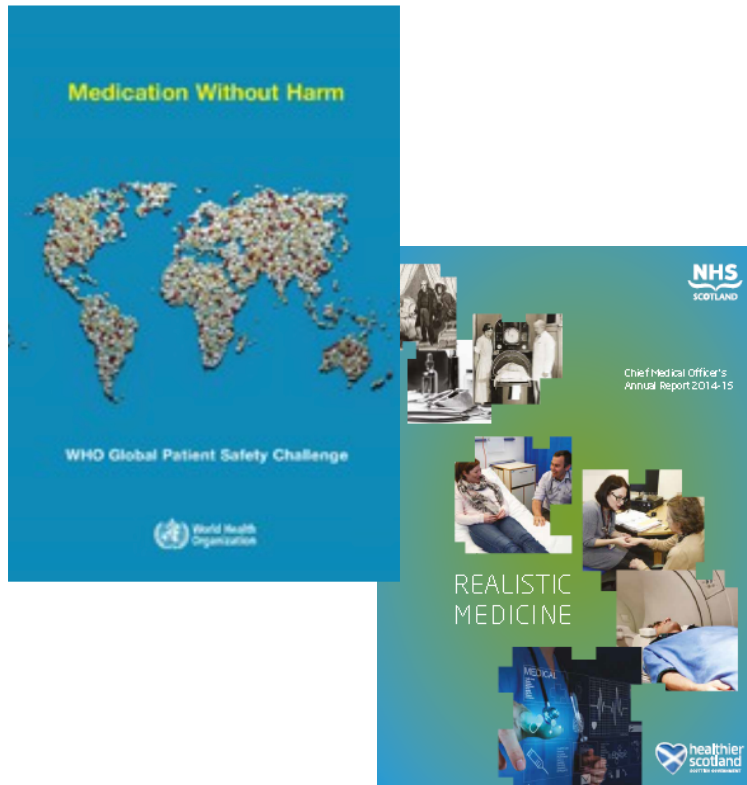
Improving prescribing through big data approaches—Ten years of the Scottish Prescribing Information System

Marion Bennie, William Malcolm, Stuart McTaggart, Tanja Mueller

First published: 22 November 2019 | <https://doi.org/10.1111/bcp.14184>

Health System Context

Policy alignment



Senior management & frontline clinicians



Contact us | Work with us | Low graphics



Home About us News and events Evidence Improvement Scrutiny Resources Our work

Home > Patient safety > SPSP

SPSP

- SPSP: Acute adult
- SPSP: HAI
- SPSP: Maternity and children
- SPSP: Mental health
- SPSP: Medicines
- SPSP: Primary care

Improvement



Safety is at the heart of our work

The Scottish Patient Safety Programme (SPSP) is a national quality improvement programme that aims to improve the safety and reliability of care and reduce harm.

Since its launch SPSP in 2008, the programme has expanded to support improvements in safety across a wide range of care settings including Acute and Primary Care, Mental Health, Maternity, Neonatal, Paediatric services and medicines safety.

Underpinned by the robust application of quality improvement methodology SPSP has brought about significant change in outcomes for people across Scotland. Find out more at ihub.scot/spsp

EFIPPS

Effective Feedback to Improve Primary care Prescribing Safety



Background

- High risk prescribing is common and causes considerable harm
 - 6.5 % of hospital admissions equating to 61,000 admission in Scotland per annum
- Cochrane Review (2006)* on audit and feedback
 - Called for more theory based interventions
 - Head to head comparisons of different ways of doing audit and feedback
- 2012 update - similar findings

* Jamtvedt G et al (2006) Audit and feedback: effects on professional practice and health care outcomes. The Cochrane database of systematic reviews: CD000259

Phase 1

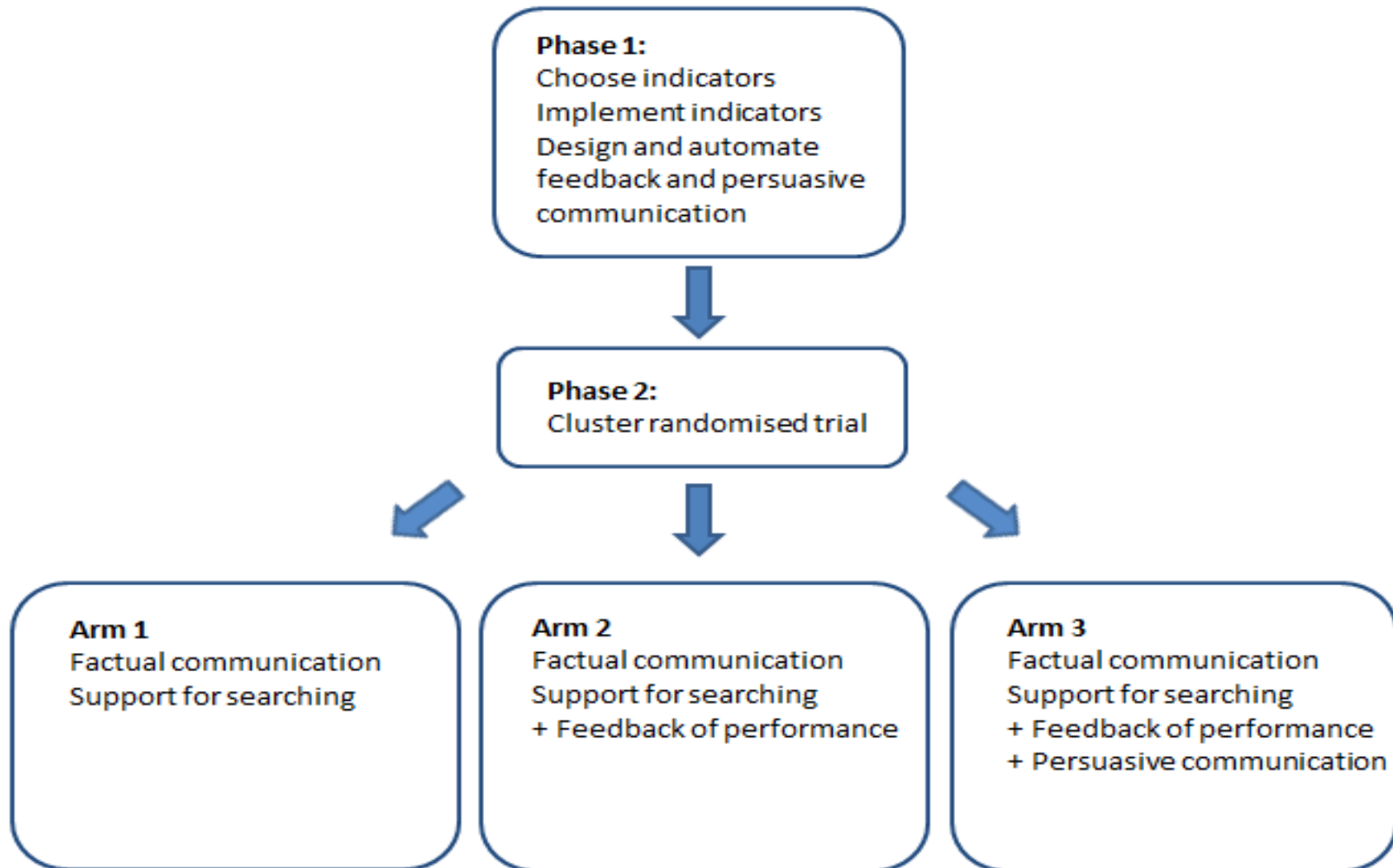
– Theory informed intervention

- Theory of Planned behaviour (TPB)
 - Attitude
 - Subjective norms
 - Perceived behavioural control
- Health Action Process Approach (HAPA)
 - Action planning
- Development of measures
 - 4 Focus groups (GPS and primary care pharmacists)
 - 2 stage Delphi study (GPs)
- Delivery
 - Limited to 1 page A4 persuasive communication
 - Each round of feedback had a different behaviour change focus

Phase 1 – selected indicators

1. Oral **antipsychotic prescription** to a patient aged 75 years and over
2. Oral **NSAID** prescription to a patient aged 65 years and over who is currently prescribed a **diuretic and an ACE inhibitor or Angiotensin Receptor Blocker**
3. Oral **NSAID** prescription to a patient aged 75 years and over who is not currently prescribed a gastroprotective drug.
4. Oral **NSAID** prescription to a patient aged 65 years and over who is currently prescribed either **aspirin or clopidogrel**, but is not currently prescribed a gastroprotective drug
5. Oral **NSAID** prescription to a patient currently prescribed an **oral anticoagulant** but who is not currently prescribed a gastroprotective drug
6. **Aspirin or clopidogrel prescription** to a patient currently prescribed an **oral anticoagulant** but who is not currently prescribed a gastroprotective drug

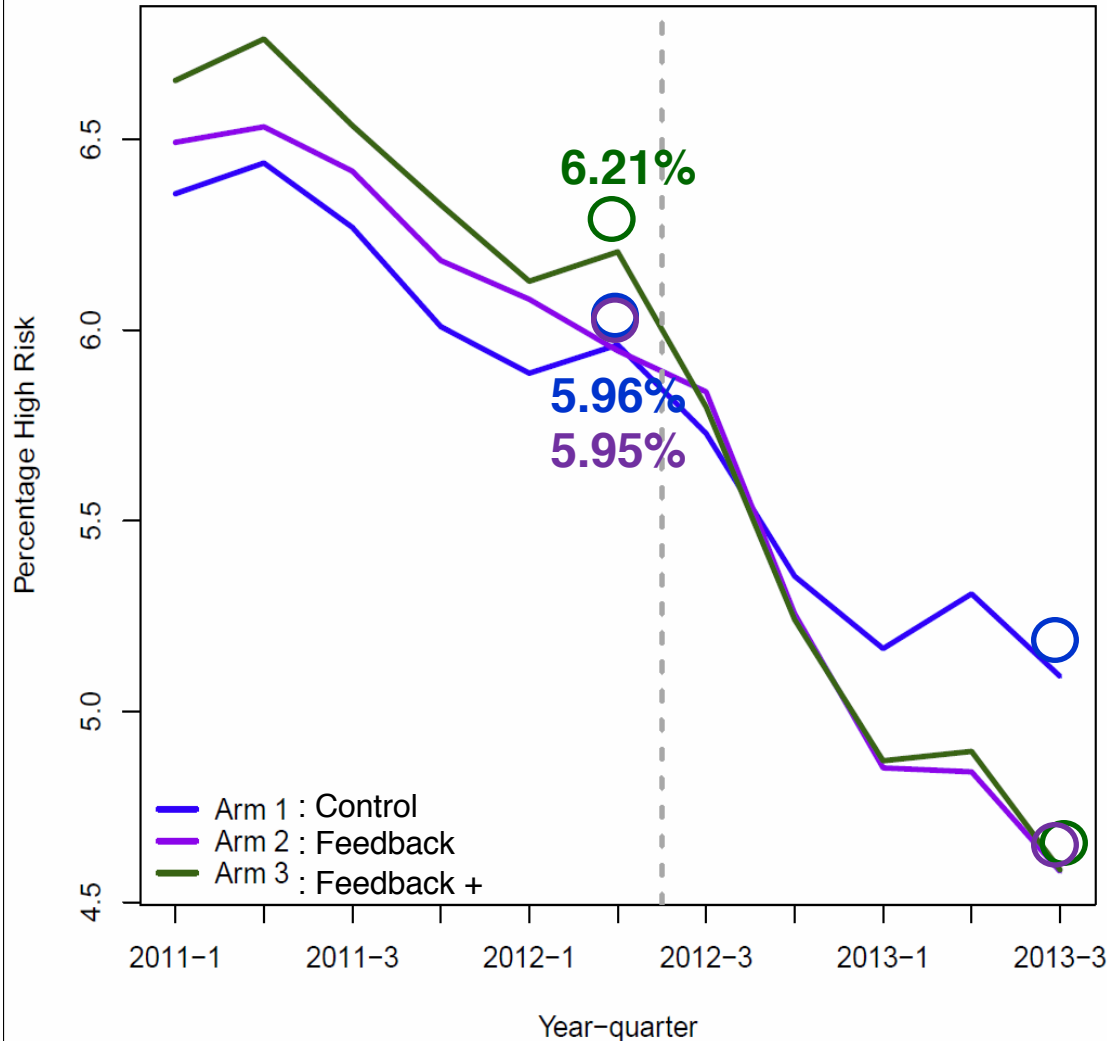
EFIPPS – Effective Feedback to Improve Primary care Prescribing Safety



Number eligible **Arm 1: 55896** **Arm 2: 56194** **Arm 3: 58569**



Time of randomisation
↓



Arm 2 significantly lower Arm 1 (-0.51)
(OR=0.87, 95%CI(0.8,0.96))

Arm 3 significantly lower Arm 1 (-0.5)
(OR=0.86, 95%CI(0.8,0.94))

Practices in “High” HR group still higher HR prescription than “Low” group
(OR=2.2)

No significant difference in intervention effect between health boards

Conclusion

- 12-14% reduction in HRM prescribing among practices that received feedback (arm 2&3) versus simple educational intervention
- Relatively simple, easy to deliver and nationally scalable provision of feedback could reduce use of HRMs.

Evidence into Practice at scale

- General Practice
 - National Therapeutic Indicators resource 2018 (all 9444 GP)
 - Polypharmacy Guidance Realistic Prescribing 2018

National Therapeutic Indicators

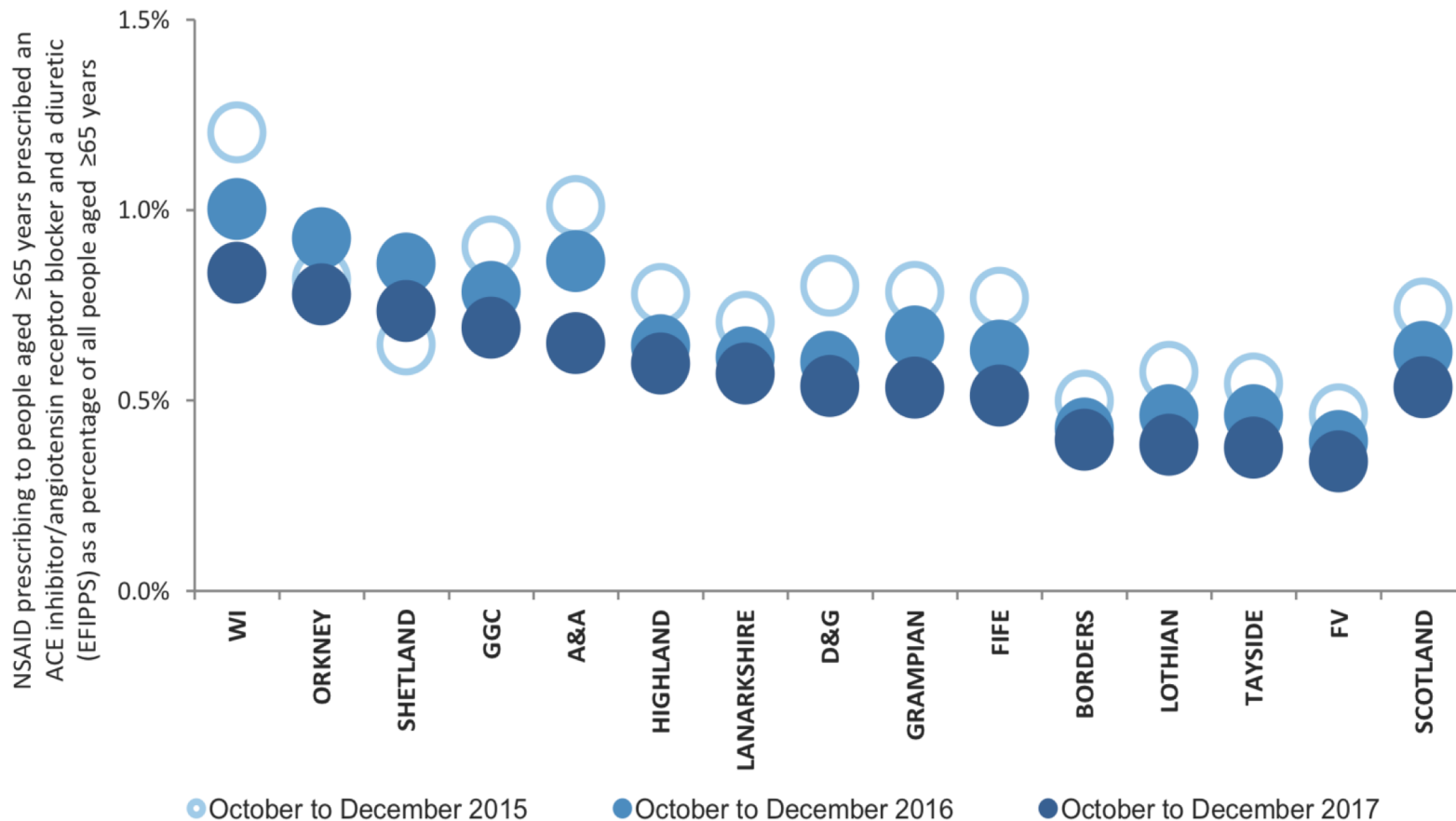
Example - Patients aged ≥ 65 yrs co-prescribed a NSAID and an ACE / ARB and a diuretic as a percentage of all people aged ≥ 65 yrs prescribed an ACE/ARB and a diuretic

[https://www.therapeutics.scot.nhs.uk/wp-content/uploads/2018/08/National-Therapeutic-Indicators-Report-2018-19-](https://www.therapeutics.scot.nhs.uk/wp-content/uploads/2018/08/National-Therapeutic-Indicators-Report-2018-19-Version-1.0.pdf)

[Version-1.0.pdf](#)



Triple whammy - NHS Board Trend



Polypharmacy / National Therapeutic Indicator metrics in NHS Discovery Platform



NSS Discovery Level 1 Polypharmacy Summary View

Select Health Board

SCOTLAND

Comparators

(at least one must be selected)

SCOTLAND



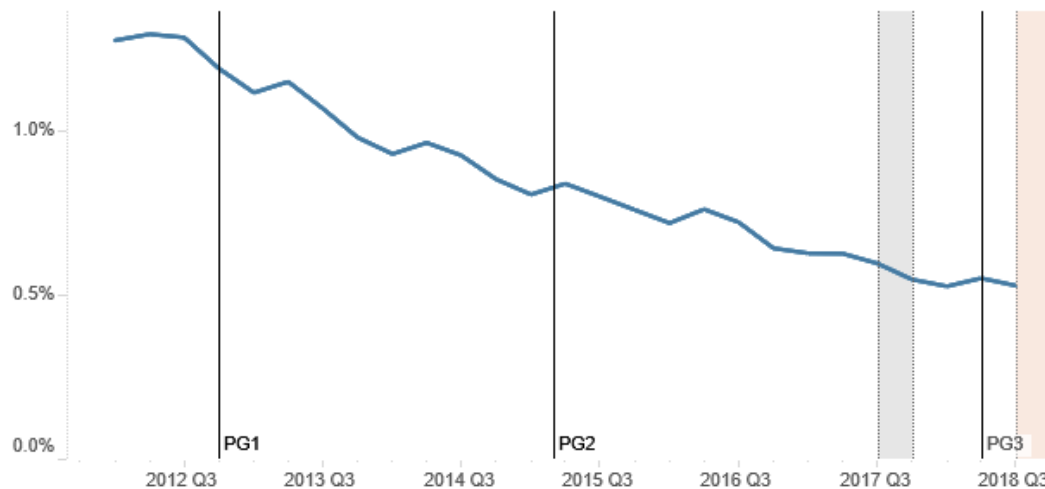
Select Quarter

2018 Q3

Indicator Description

PRM 14: NSAIDs: NSAID prescribing to patients aged ≥ 65 years prescribed an ACE inhibitor/angiotensin receptor blocker and a diuretic as a percentage of all people aged ≥ 65 years

- PRM 1
- PRM 2
- PRM 3
- PRM 4
- PRM 5
- PRM 6
- PRM 7
- PRM 8
- PRM 9
- PRM 10
- PRM 11
- PRM 12
- PRM 13
- PRM 14
- PRM 15
- PRM 16
- PRM 17



Comparator aggregate

2017 Q3

2018 Q3

0.6%

0.5%

Selected Board Performance

2017 Q3

2018 Q3

0.6%

0.5%

To download data from the table, please click on any cell, select Download, then Crosstab from the top Tableau bar.

Low rates/ratio desired: values

Evidence into Practice at scale

- General Practice
 - National Therapeutic Indicators resource 2018 (all 9444 GP)
 - Polypharmacy Guidance Realistic Prescribing 2018
- Community Pharmacy : Scottish Patient Safety Programme Collaborative : Pharmacy in Primary Care

HRM care bundles intervention (NSAIDS) in 29 community pharmacies in 2014 (breakthrough series collaborative model approach – co-design and testing) *

- NSAID communication care bundle
- NSAID safer care bundle

Introduced in 2018/2019 Community Pharmacy contract (n=1257) as a paid service
New Zealand health system (Auckland) have adopted the NSAID care bundle

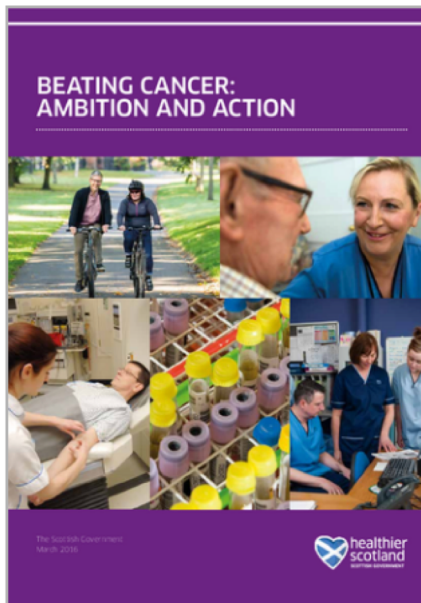
* Weir NM, Newham R, Dunlop Corcoran E, Ali Atallah Al-Gethami A, Mohammed Abd Alridha A, Bowie P, Watson A, Bennie M. (2017) Application of process mapping to understand integration of high risk medicine care bundles within community pharmacy practice. Res Social Adm Pharm, 14(10):944-950. doi: 10.1016/j.sapharm.2017.11.009

New Cancer Medicines (Secondary / Hospital Care)

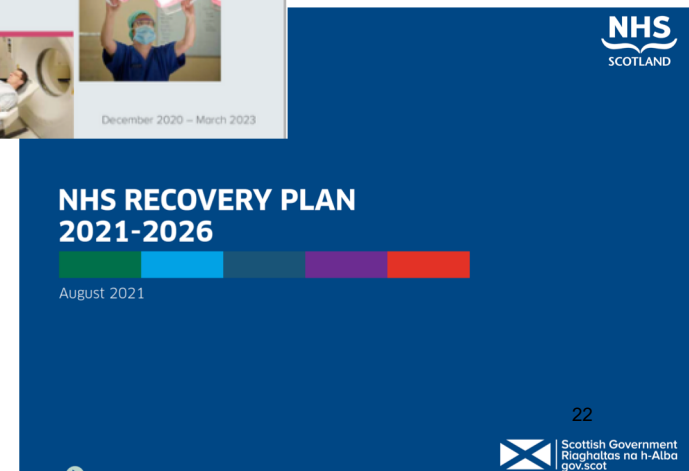
-safety and effectiveness in routine
clinical practice

Health System Policy Context

2016 - 2020



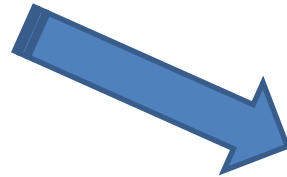
2020-2026



Introduction of new cancer medicines



Clinical trial population



1. EUROPE / UK STAGE
European Medicines Agency (EMA) or
Medicines and Healthcare Regulatory Authority
(MHRA)

2. NHS SCOTLAND STAGE
Scottish Medicines Consortium (SMC) or
National Institute for Health and Clinical
Excellence (NICE)

3. REGIONAL (WoS) STAGE
Regional Cancer Advisory Group (RCAG)
Prescribing Advisory Subgroup
(via ADTC Formulary and New Drugs Subcommittee)

4. LOCAL (NHSGGC) STAGE
Area Drug and Therapeutics Committee (ADTC)



'Real world'

*How will this
treatment benefit
me?
What side effects
can I expect?*

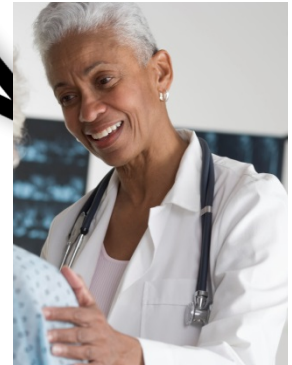
*How do I select patients
who will benefit?*

*What monitoring do I
need to do?*

*What are the long term
effects e.g. cardiac?*

*What value does
this medicine add?*

*What is the
service impact?*



Cancer Medicines Outcomes Programme

Quantitative Work Stream

**Clinical
Effectiveness**



**Quality of
Life**



Qualitative Work Stream

**PATIENT
&
CLINICIAN**

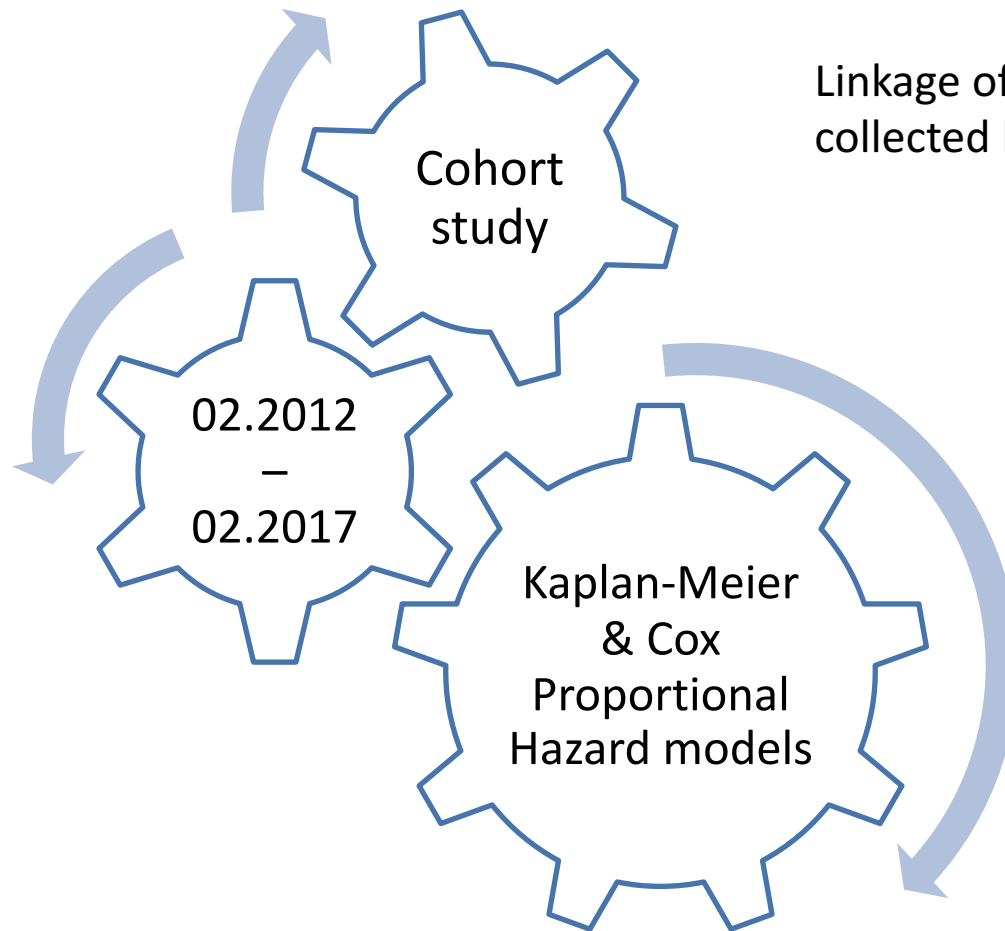
Trial eligibility and treatment outcomes of cancer medicines in a real-world population: an example from Scotland

Tanja Mueller, Kelly Baillie, Jiafeng Pan, Jennifer Laskey, Marion Bennie

Study aims

1. To describe a Scottish cohort of patients with **metastatic castration-resistant prostate cancer** treated with **abiraterone or enzalutamide**;
2. To identify potentially **trial eligible patients** using published criteria for enrolment in the respective clinical trials; and
3. To analyse **treatment outcomes**, both overall as well as for the trial-eligible subgroup of patients.

Methodology



Linkage of routinely
collected healthcare data

Data availability



Hospital records



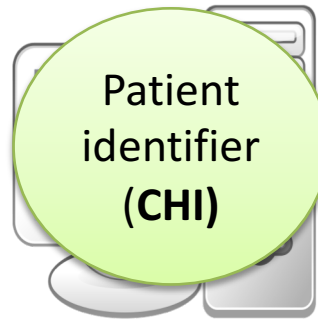
Chemotherapy prescribing
(CEPAS)



Laboratory test results



Radiotherapy treatment



Patient
identifier
(CHI)



Primary care prescriptions

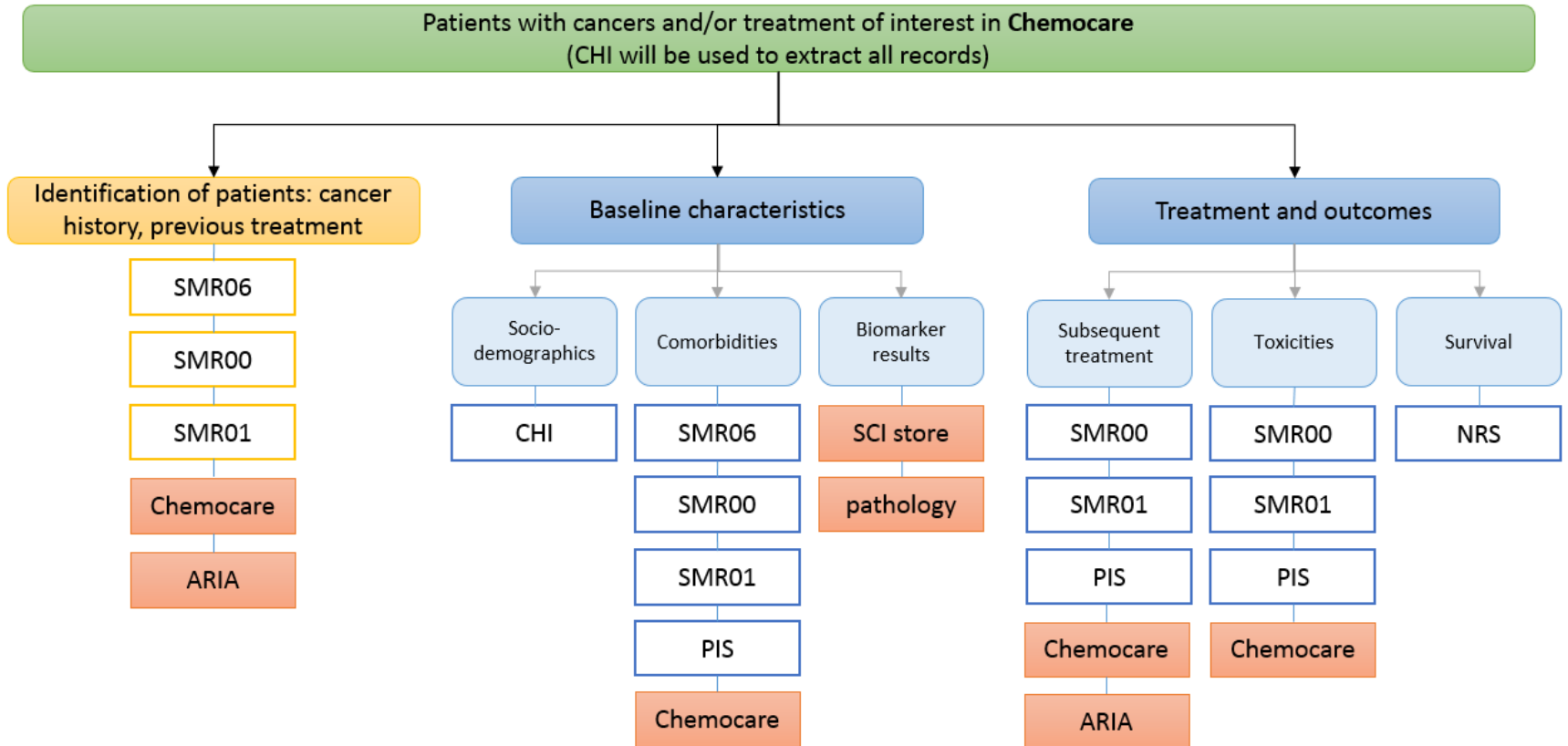


Cancer registry

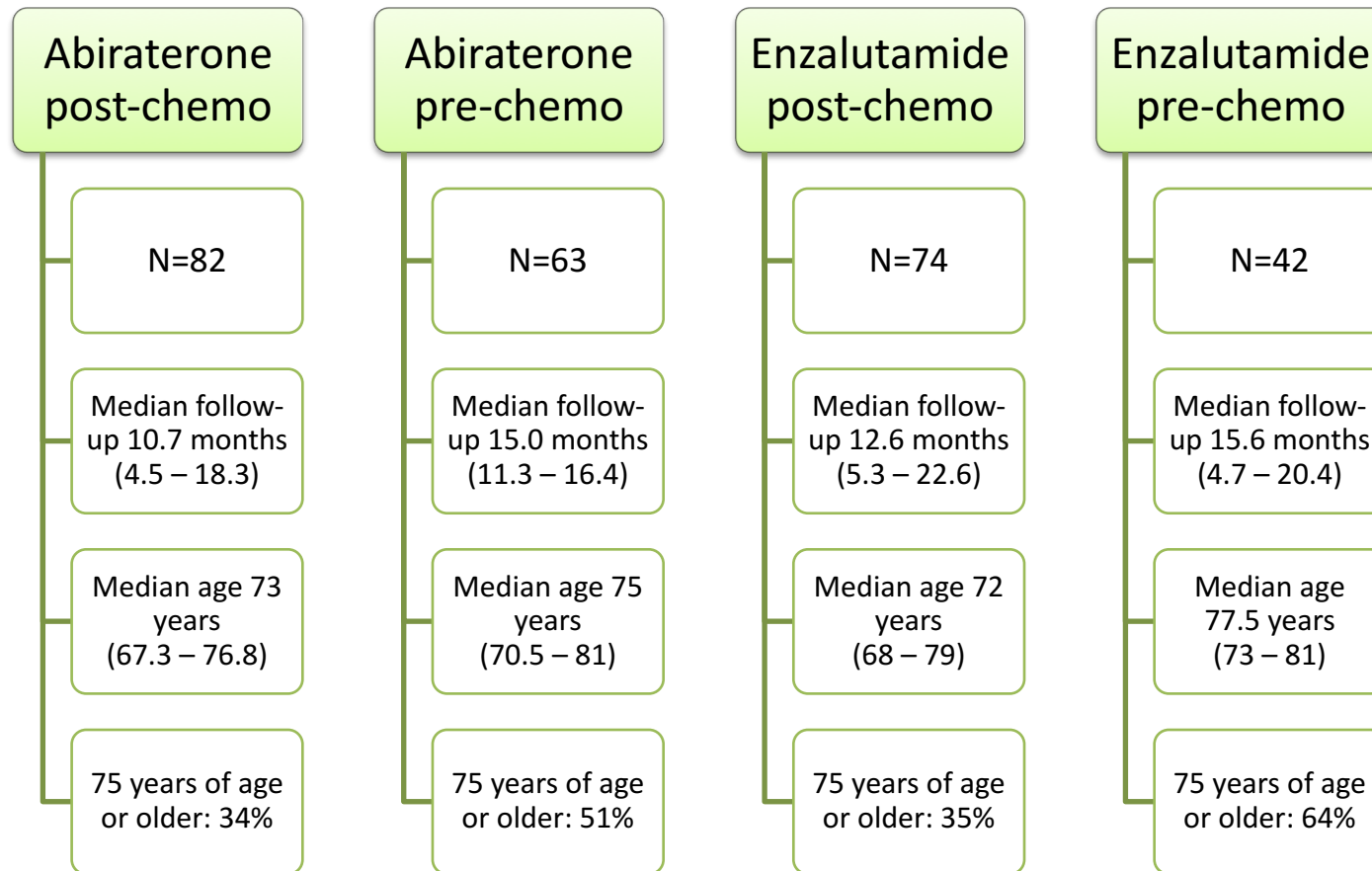


Death records

Electronic Record Linkage (ERL)



Results: patient baseline



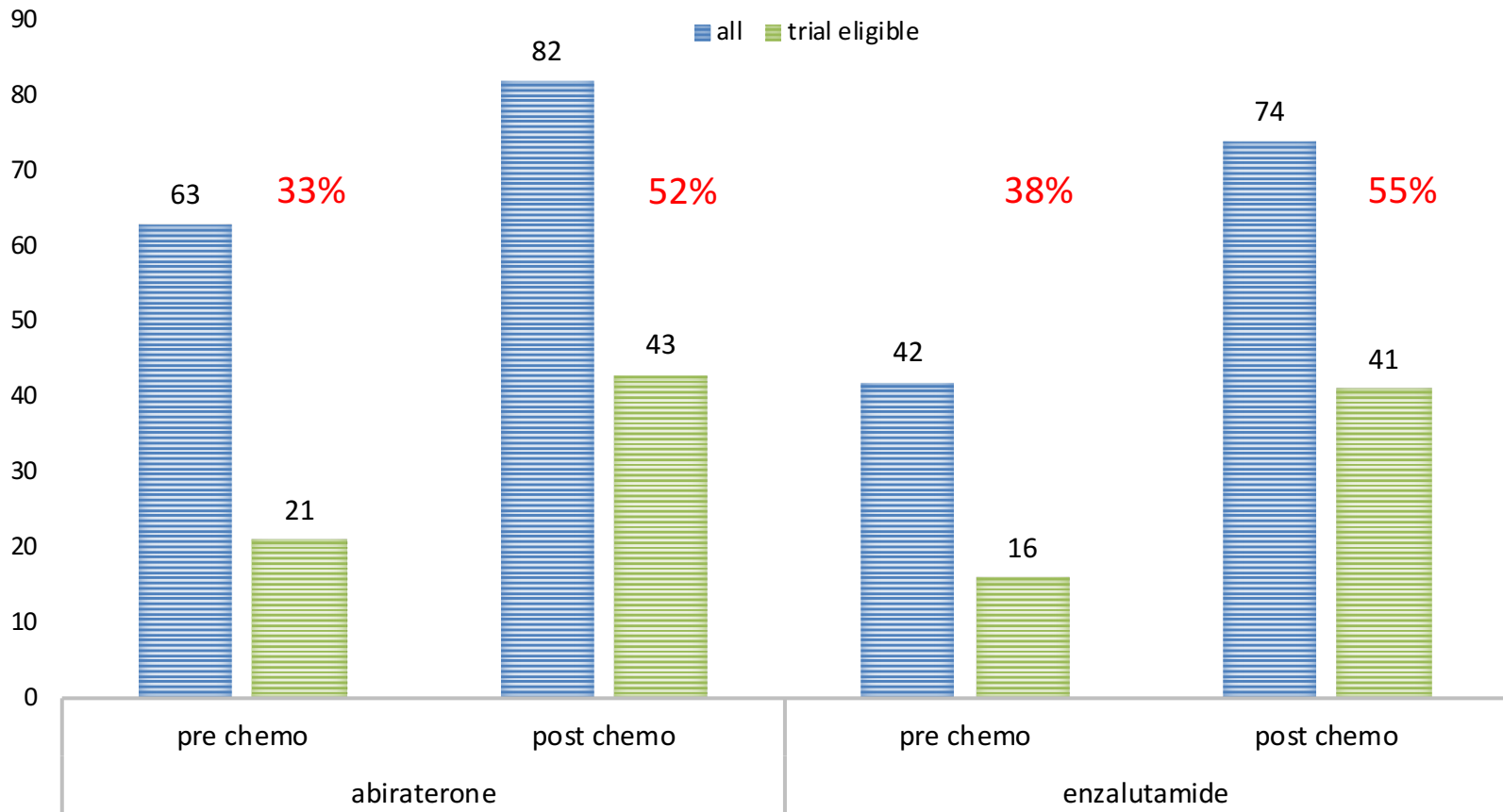
Results: trial eligibility

- **70 different eligibility criteria identified across four trials**
 - 19 inclusion criteria (such as age, previous prostate cancer treatment, performance status, serum testosterone)
 - 51 exclusion criteria (including blood test values, comorbidities, other prior treatment, concomitant medication)

- All inclusion criteria needed to be fulfilled; exclusion when at least one of the exclusion criteria applied

- On average, **64% of inclusion criteria and 55%** of exclusion criteria determinable from health care records

Results: trial eligibility



Results: treatment outcomes

Treatment		Median OS (95% CI) [months]	Median OS (95% CI) [months]	Median OS (95% CI) [months]
		Overall cohort – all patients	Pivotal clinical trials	Subgroup: trial eligible patients
abiraterone	Post chemotherapy	10.8 (8.6 – 15.1)	15.8 (14.8 – 17.0)	
	Pre chemotherapy	20.9 (14.9 – 29.0)	34.7 (32.7 – 36.8)	
enzalutamide	Post chemotherapy	12.6 (10.5 – 18.2)	18.4 (17.3 – NR)	
	Pre chemotherapy	16.0 (9.8 – NR)	35.3 (32.2 – NR)	

Results: treatment outcomes

Treatment		Median OS (95% CI) [months]	Median OS (95% CI) [months]	Median OS (95% CI) [months]
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abiraterone	Post chemotherapy	10.8 (8.6 – 15.1)	15.8 (14.8 – 17.0)	13.9 (9.8 – 18.3)
	Pre chemotherapy	20.9 (14.9 – 29.0)	34.7 (32.7 – 36.8)	26.7 (20.4 – NR)
enzalutamide	Post chemotherapy	12.6 (10.5 – 18.2)	18.4 (17.3 – NR)	18.2 (12.1 – 30.0)
	Pre chemotherapy	16.0 (9.8 – NR)	35.3 (32.2 – NR)	19 (NR – NR)

ORIGINAL REPORT |  Open Access |  

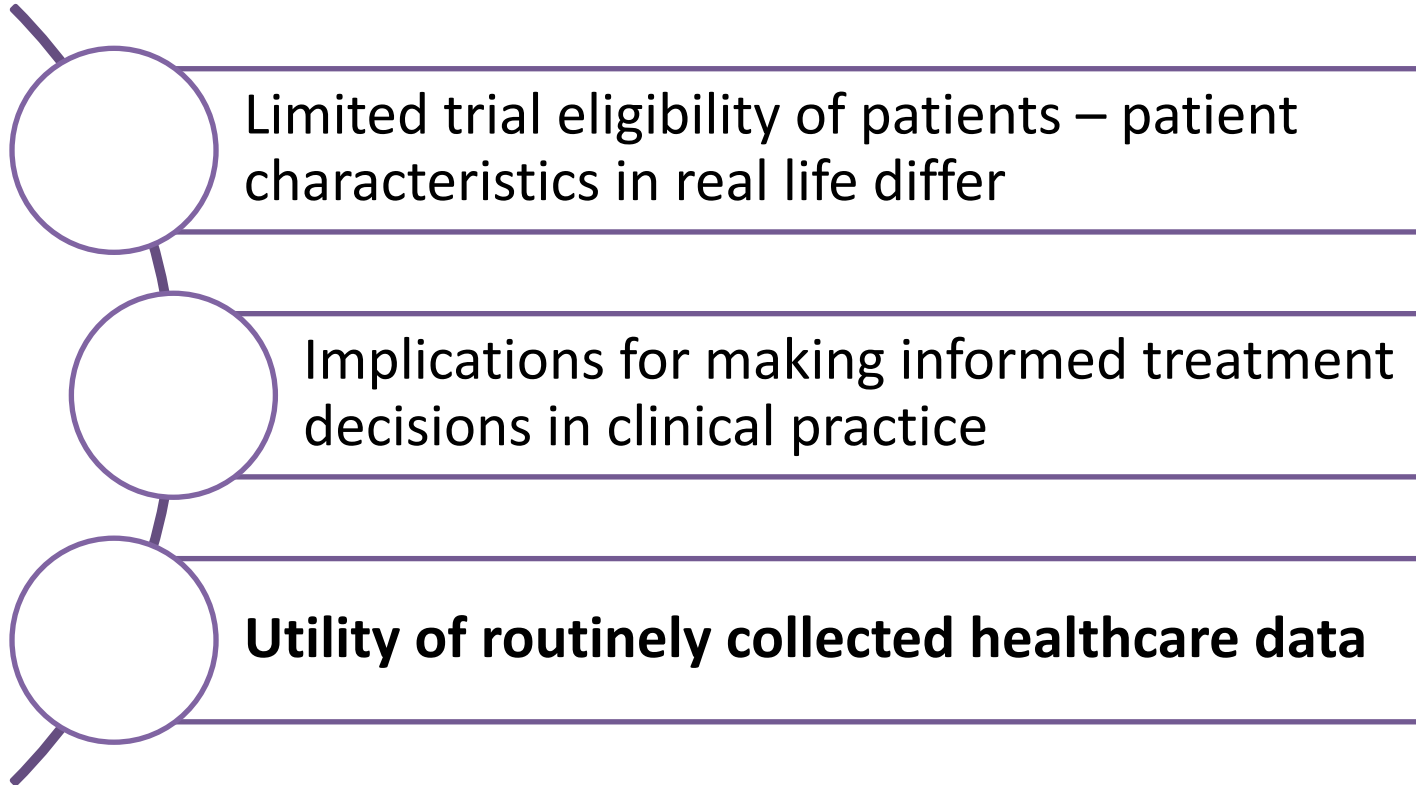
Use of record linkage to evaluate treatment outcomes and trial eligibility in a real-world metastatic prostate cancer population in Scotland

Kelly Baillie , Tanja Mueller, Jiafeng Pan, Jennifer Laskey, Marion Bennie ... [See all authors](#) 

First published: 21 April 2020 | <https://doi.org/10.1002/pds.4998> | Citations: 1

Funding information: Scottish Government

Conclusion



CMOP website

<https://ggcmedicines.org.uk/cmop/>

[Our experiences of working with Cancer data in Scotland](#)

[Mueller T, Laskey J, Baillie K, et al \(2021\) Opportunities and challenges when using record linkage of routinely collected electronic health care data to evaluate outcomes of systemic anti-cancer treatment in clinical practice. medRxiv 2021. doi.org/10.1101/2021.05.28.21257611 \[Pre-Print\]](#)

Medicines Programs

- High Risk Medicines
- Antimicrobial Stewardship +
- Cancer Medicines
- COVID related
 - COVID medicines treatment in our hospitals
 - Vaccination surveillance
 - Impact on routine care - medicines*
- Medicines in Pregnancy (Sodium Valproate)

* <https://www.publichealthscotland.scot/our-areas-of-work/covid-19/covid-19-data-and-intelligence/covid-19-wider-impacts-to-the-health-care-system/>

+ Bennie M, Malcolm W, Marwick CA, Kavanagh K, Sneddon J, Nathwani D. Building a national infection intelligence platform to improve antimicrobial stewardship and drive better patient outcomes: the Scottish experience. J Antimicrob Chemother. 2017;72(10):2938-2942.

Thank You

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- Public and Patients