



AN RIALTÓIR CÓGAISÍOCHTA  
THE PHARMACY REGULATOR

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## Supporting Paper D

# Potential cost avoidance opportunities

Supporting research for the Future Pharmacy Practice in Ireland -  
Meeting Patients' Needs Report, 2016

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**Private and confidential**

Pharmaceutical Society of Ireland  
PSI House  
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24 June 2016

To whom it concerns,

**Future Pharmacy Practice – Potential Cost Avoidance Opportunities**

These case studies, which outline potential cost avoidance opportunities, are provided solely to the PSI. PwC accepts no liability to any other person in respect of the case studies.

The case studies are based on data from secondary sources and no primary research has been undertaken. As such, there were limitations to the input data. Using available data the case studies are presented to provide an assessment of the potential cost reduction opportunities associated with the introduction or expansion of pharmacist's activities. As with any data derived from research studies, the resultant figures are indicative.

This report should not be used for investment decisions, without first obtaining independent financial advice.

Yours sincerely,

PricewaterhouseCoopers

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# 1. Summary

PricewaterhouseCoopers (PwC) carried out this work as part of the Pharmaceutical Society of Ireland's (PSI) Future Pharmacy Practice Project. The key objectives of the Future Pharmacy Practice Project are to explore how pharmacists can most valuably contribute to the health and wellbeing of patients in Irish healthcare. Part of the project was to analyse the potential cost reduction and/or avoidance opportunities associated with the introduction or expansion of pharmacists' clinical activities. The project was to review three potential new services available in other jurisdictions. The analysis was to assess the benefit to the patient and the wider health service.

The Project Steering Group agreed three case studies for analysis:

1. Medicines management in a hospital setting-clinical pharmacy services
2. Medicines optimisation services-newly diagnosed asthma patients, with structured support to optimise therapy
3. Medicines optimisation by a pharmacist in a nursing home setting, in collaboration with the nursing staff, the patient and the patient's GP.

A summary of the services and benefits are outlined below:

	<i>Summary of service</i>	<i>Benefit to patient</i>	<i>National cost impact</i>
<b>1. Medicines Management in a Hospital Setting-Clinical Pharmacy Services</b>	Clinical Pharmacy Services extended to all hospitals in Ireland, to include 1) Clinical pharmacist intervention at the point of admission; 2) pharmacist-led patients chart review; 3) pharmacist reviews conducted at the request of another health professional.	Improved patient outcomes through the reduction in adverse drug events and deterioration of their illness due to omission of medicines.	<ul style="list-style-type: none"> <li>• Net cost avoidance associated with potential additional treatment as a result of adverse drug events of €19.7m in smaller Irish hospitals, creating a nationwide cost avoidance of €40.1m in all Irish hospitals</li> <li>• Potential additional reduced cost due to a reduction in the volume and value of drugs prescribed and the use of therapeutic substitutes, preferred formulations and biosimilars.</li> </ul>
<b>2. Medicines Optimisation Services-Newly Diagnosed Asthma patients, with structured support to optimise therapy</b>	A structured introduction to medicine regimes for chronic illnesses via three structured consultations with the pharmacist in the first three weeks of the regime. Non-adherence is intervened through a collaborative approach between the pharmacist, the GP and other healthcare professionals.	An increase in the probability of adherence to the medication regime and thus better disease control, less hospitalisations and improved mortality.	<ul style="list-style-type: none"> <li>• A cost reduction of €1,466 over the lifetime of each patient.</li> <li>• Nationwide implementation over a five year period would achieve a net cost reduction of €2.3m</li> </ul>
<b>3. Medicines Optimisation by a pharmacist in a nursing home setting, in collaboration with the nursing staff, the patient and the patient's GP.</b>	An annual multidisciplinary structured medicines review for older residents of Long Term Residential Care who are prescribed 5 medicines or more to identify and reduce inappropriate prescribing and limit associated potential adverse drug events.	Improved health outcomes in terms of a reduced likelihood of adverse drug events and associated hospitalisation.	A potential reduction in cost associated with hospitalisations resulting from inappropriate polypharmacy of €2.74m per year.

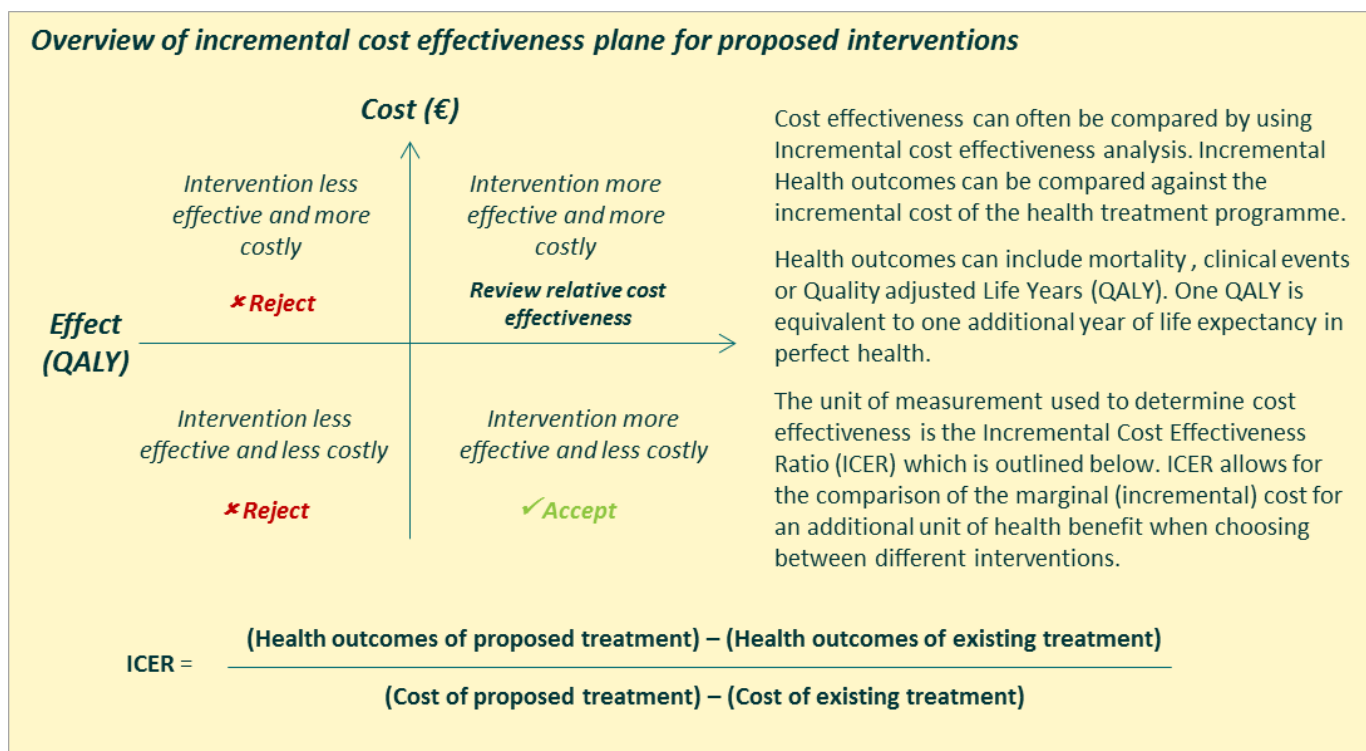
## 2. Introduction

Ireland's health system faces an unprecedented growth in healthcare demand as a result of an ageing population. This coupled with heavily constrained public finances, creates an imperative that the public health budget is distributed effectively to achieve the greatest total health outcomes for patients.

This section of the report outlines instances where the implementation of systematic pharmacy intervention can lead to demonstrably positive health outcomes, while potentially avoiding more costly health interventions. This can best be demonstrated as a principle of 'investing to save' whereby an intervention as a preventative measure, or at an early stage of an illness, can stop the condition developing to a higher level of acuity. Generally the cost implications of treatment increase substantially at higher acuity levels (i.e. the cost of a GP visit is c. €55 whereas the cost of a hospital bed night can be c. €1,000<sup>1</sup>). These saved treatment costs, clinical time and bed day capacity can then be reallocated more effectively to provide a greater level of outcomes across the whole population.

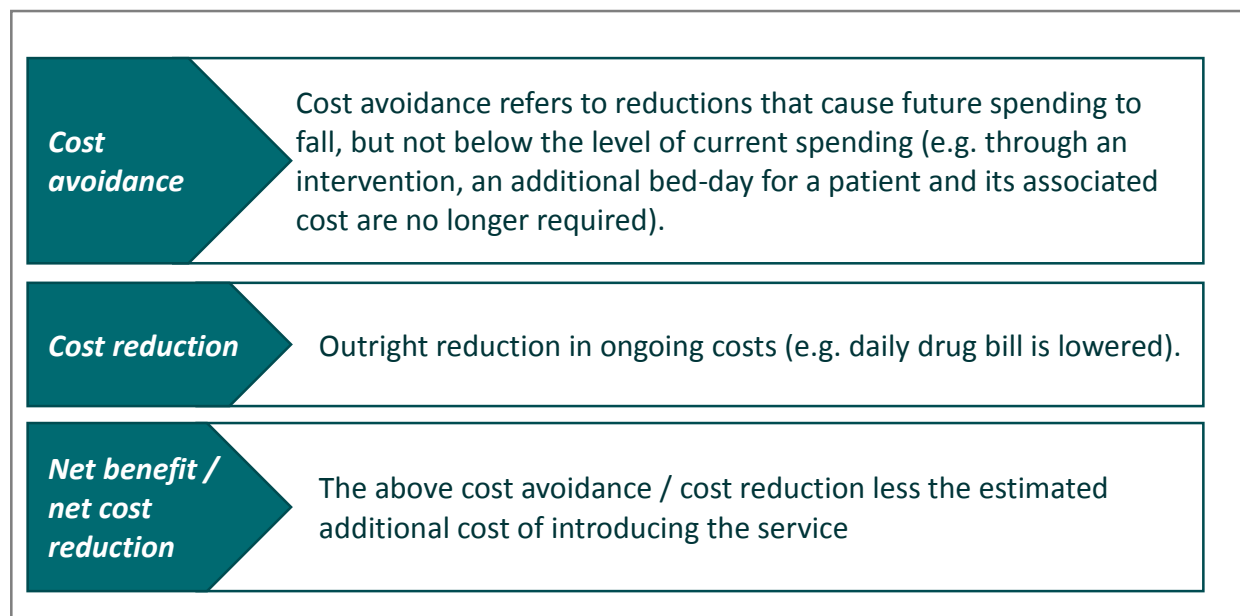
For some illnesses, the cost of treatment at a later stage can be particularly high. For instance, diabetes can develop into a range of comorbidities including blindness, renal failure, stroke, congestive heart failure and a requirement for amputation<sup>2</sup>. A relatively small investment in interventions by pharmacists can help to avoid these outcomes. Incremental cost effectiveness analysis (outlined below) can be used to analyse the extent to which pharmacy can improve health outcomes, at reduced cost to health system. This method of analysis is used internationally to compare prospective health interventions<sup>3</sup>.

Figure 1: Overview of incremental cost effectiveness



The following three cases will outline the potential benefit that may be achieved through pharmacy interventions based on secondary data, largely sourced from cost effectiveness analysis conducted as part of academic studies. The case studies will attempt to quantify the potential health benefit nationally and the potential cost avoidance, which could be achieved through implementation of the interventions.

Figure 2: Cost terms explained



### Limitations

The case studies do not represent cost-effectiveness studies themselves and do not rely on primary research. In assessing this potential for cost avoidance, best available secondary evidence has been used to the extent that it is available, including use of international proxies where Irish data is unavailable.

While only one of the case studies (Case Study 2) factors benefits accrued in years after the introduction of the intervention, these benefits have not been discounted to today's prices.

### 3. Case Study 1. Medicines Management in a Hospital Setting – Clinical Pharmacy Services

Dedicated clinical pharmacy services exist in many hospitals in Ireland, particularly tertiary referral and teaching hospitals. Clinical pharmacy has been defined as a health science discipline in which pharmacists provide patient care that optimises medication therapy and promotes health, wellness, and disease prevention<sup>4</sup>.

The research<sup>5</sup> for this report indicates variations in the level, frequency and availability of clinical pharmacy services in Ireland, and suggests that the delivery of evidence based medication management services involving pharmacy to patients in adult, acute public hospitals could be improved, particularly in the rural setting. This profile of clinical pharmacy services was further confirmed through our consultation process.

This cost-effectiveness review examines Irish data on clinical pharmacist interventions in a university hospital and compares it with a European study.

A number of studies<sup>6,7,8</sup> have been conducted to demonstrate the cost effectiveness of clinical pharmacy services and clinical pharmacist interventions. In particular, Gallagher et al<sup>9</sup> conducted a year long study to estimate the cost avoidance generated by pharmacist interventions at Cork University Hospital (CUH) due to the prevention of Adverse Drug Events (ADEs). The International Conference on Harmonisation Technical Requirements for Registration of Pharmaceuticals for Human Use (ICH) defines an ADE as “any untoward medical occurrence in a patient administered a medicinal product which does not necessarily have to have causal relationship with treatment”. This study can be used as a base case to assess the potential benefit of implementing such clinical pharmacist interventions in Ireland.

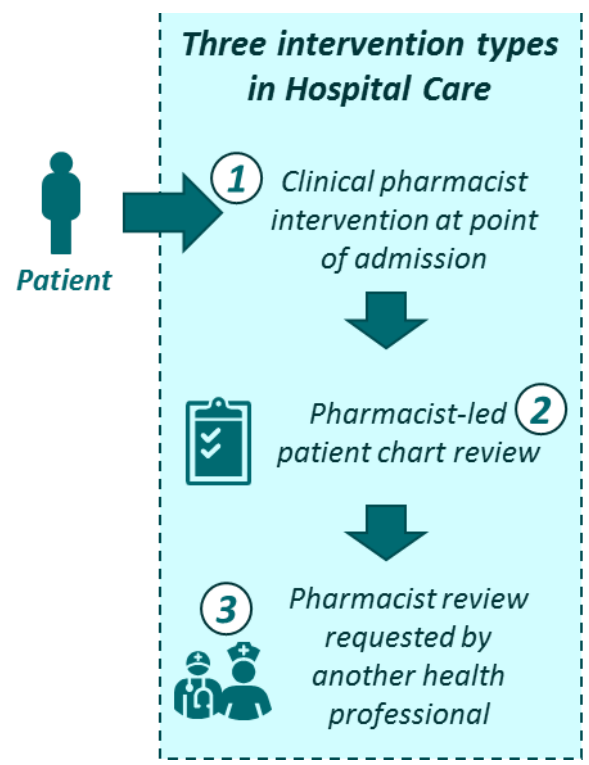
#### Clinical pharmacy services - interventions

A pharmacist intervention is defined in the Gallagher paper as “any action taken by a pharmacist that aims to change patient management or therapy”. In CUH, clinical pharmacist interventions are carried out at patient admission, during a pharmacist led prescription chart review or at the request of another health professional (see Figure 3). The types of interventions made by pharmacists in this study are shown in Figure 4, and relate to issues such as omission of medication therapy, drug interactions, incorrect doses etc.

#### Patient benefits

Cost avoidance was calculated based on the probability that an ADE would have occurred in the absence of the proposed pharmacist intervention. 29% of interventions avoided ADEs that have a medium to high (40-60% likely) probability of occurring, and thus the cost avoidance can be reasonably quantified based on: the likely outcome of the ADE X the probability of the ADE happening. The incremental cost of achieving this benefit was quantified on the basis of the salary and other employment costs of the Full Time Equivalent

Figure 3: Intervention opportunities as outlined in the base study

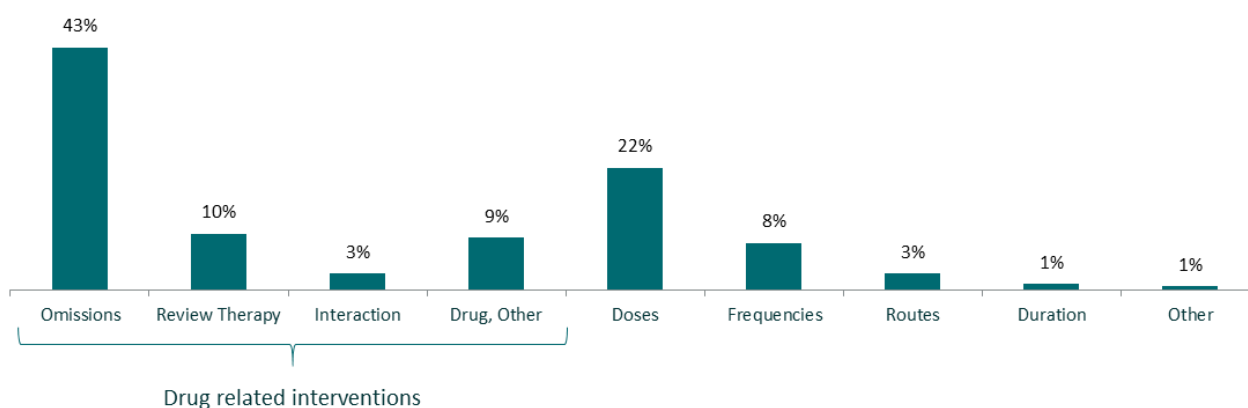


(FTE) effort required to carry out the interventions – this was calculated as per Gallagher et al as requiring 22 minutes per intervention.

The interventions carried out had a direct positive affect on patients, with the avoidance of harm directly or indirectly related to their prescribed/administered medicines, and the potential of omission of regular medication, sub-therapeutic dosing or an ill-advised choice of therapy. 65% of all interventions related directly to the drug, the most prevalent impact of which was in the identification of omissions of patients' regular pre-admission medication.

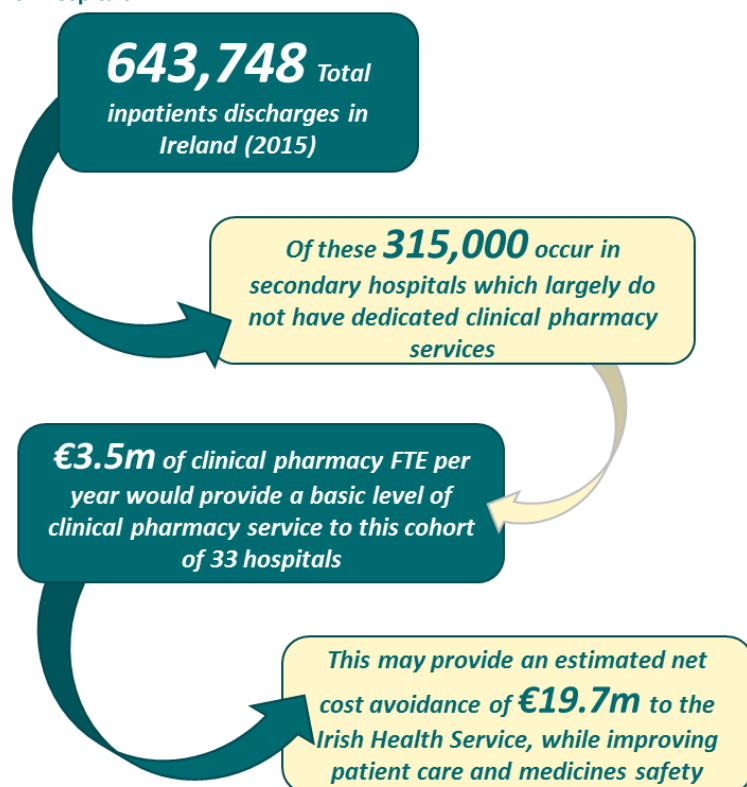
Figure 4: Hospital pharmacist interventions

Interventions by type



The implementation of these clinical pharmacy services is likely to have a positive effect on health outcomes of patients and reduce costs in the health system. If this were implemented more widely in Irish hospitals, where pressures on dispensing functions mean that there is less resourcing dedicated to clinical

Figure 5: Estimated potential benefit of basic clinical pharmacy service in Irish hospitals



pharmacy services, then substantial benefits could be achieved.

Gallagher et al. indicate a mean cost avoidance of €166 per intervention was achieved, with a cost benefit ratio of 8.64.

This study was used as a baseline to quantify the benefit of implementing this level of clinical pharmacy services in hospitals other than tertiary referral centres. Core assumptions included a low utilisation rate of pharmacist time in carrying out interventions, reflecting the fact that pharmacists would spend time consulting with both patients who required intervention as well as those who did not. This differs from the Gallagher approach, which sought to quantify the benefit of an existing service. Figure 5 illustrates the estimated potential benefit of basic clinical pharmacy service in Irish hospitals.

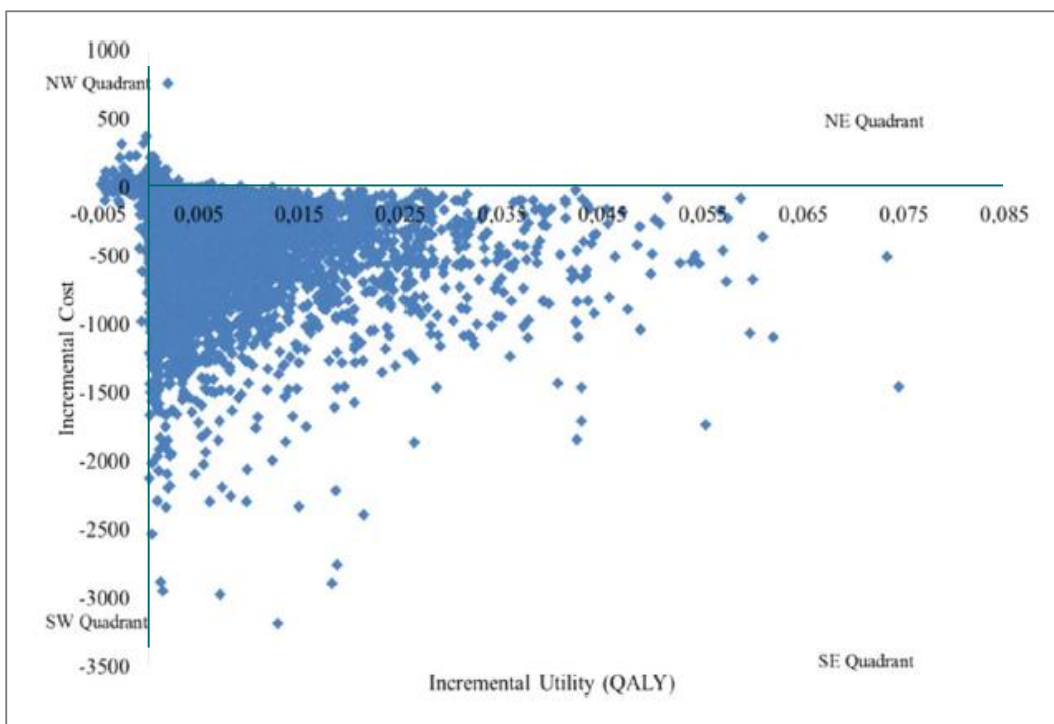


Estimates under these circumstances suggest that the introduction of clinical pharmacy service (as described for CUH) to hospitals assumed to have low levels of clinical pharmacy services, could yield a potential net saving of **€19.7m with a cost benefit ratio of 5.6**<sup>10</sup>. The scale of opportunity in each Irish public hospital was identified as part of this process<sup>11</sup>.

While these estimates and costings provide a basis for quantifying the potential of the implementation of clinical pharmacy services, a complete picture of the potential benefit would require an investigation into the current level of clinical pharmacy service provided in each hospital in Ireland to appropriately quantify the counterfactual provision. Indeed, while a core assumption was made that clinical pharmacy services were currently prevalent at all major tertiary referral hospitals, there may be scope for further investment in these services to achieve the benefits outlined.

The cost effectiveness of this type of hospital service is echoed in a similar study conducted in Sweden, which reviewed the cost effectiveness of systematic medication review and reconciliation from admission to discharge in older hospital patients<sup>7</sup>. In this model, named the Lund Integrated Medicines Management Model (LIMM) the pharmacist is part of an integrated team. This study revealed a similar level of cost effectiveness with a €340 cost avoidance based on a €39 intervention cost (an 8.64 cost benefit ratio, similar to the 8.2 ratio observed in the Gallagher study). The health benefits demonstrated in this study indicated an improvement in Quality adjusted life years (QALY) while achieving this cost avoidance. The cost effectiveness plane is outlined below.

Figure 6 Scatterplot in the cost effectiveness plane for the Lund Integrated Medicines Management process<sup>12</sup>:



Even at substantially lower levels of cost effectiveness than those demonstrated in the base study for this review, there is substantial cost avoidance achievable through the implementation of Clinical pharmacy services. Additionally, the base case did not include pharmacy services in relation to discharge as part of the methodology. This represents a further opportunity in benefitting the patient through the transition of care from acute to non-acute and could offer further potential cost avoidance.

## Drug costs & substitutions as a result of clinical pharmacy services

While the above cost analysis outlines the cost avoidance that can be achieved through avoided readmission or extended length of stay, there are also considerable opportunities for further savings to be achieved with regard to drugs budgets within hospitals.

There are three potential cost reductions in this regard:

1. Reduced drug budget through the reduction of volume and value of drugs that are inappropriately prescribed (e.g. Proton Pump Inhibitors (PPIs)).
2. Lower cost therapeutically equivalent drugs e.g. biosimilars
3. Use of preferred medicines as recommended by the HSE Medicines Management Programme, adopted where appropriate by the Hospital's Drugs and Therapeutic Committees, and monitored by the clinical pharmacist

Figure 7: Common medications requiring intervention in Gallagher et al study

Most common medications in intervention	
Proton Pump Inhibitors	9%
Statins	8%
Beta Blockers	6%
Corticosteroids	6%
Penicillins	5%

A basic level of clinical pharmacy services in all Irish hospitals could greatly enhance the cost-containment role of the hospital pharmacist in this regard.

<b>Potential total cost avoidance from the implementation of Clinical Pharmacy Services (CPS) across all Irish Hospitals</b>	
CPS in tertiary and specialist hospitals (assumed to be existing counterfactual provision)	€24.1m
CPS in smaller hospitals	€23.2m
Estimated potential total cost avoidance	€47.3m
<b>Estimated cost of implementation</b>	
Costs of implementation CPS in tertiary and specialist hospitals (assumed to be existing counterfactual provision)	€3.7m
Cost of CPS in smaller hospitals	€3.5m
Estimated total costs of implementation	€7.2m
<b>Net cost avoidance through implementation of CPS</b>	
Estimated potential net cost avoidance of CPS nationwide	€40.1m
Estimated potential net cost avoidance of CPS in smaller hospitals	€19.7m

## Summary of service opportunity

<b>Patient issue</b>	Consistency of safe, effective and rational use of medicines in Irish hospitals.
<b>Intervention proposed</b>	Clinical Pharmacy Services, as defined within the scope of this review include 1) Clinical pharmacist intervention at the point of admission; 2) pharmacist-led patients chart review; 3) pharmacist reviews conducted at the request of another health professional.
<b>Benefit to patient</b>	Improved patient outcomes through the reduction in adverse drug events and deterioration of their illness due to omissions of medicines.
<b>Benefit to wider health system</b>	<ol style="list-style-type: none"> <li>1. Net cost avoidance associated with potential additional treatment as a result of adverse drug events of €19.7m in smaller Irish hospitals, creating a nationwide cost avoidance of €40.1m in all Irish hospitals</li> <li>2. Potential reduced cost due to a reduction in the volume and value of drugs prescribed.</li> <li>3. Potential cost reduction due to therapeutic substitution of preferred formulations and biosimilar.</li> </ol>

## Core Assumptions

Fully loaded pharmacist salary costs (annual) <sup>9</sup>	€81,942
Average cost per Adverse Drug Event (ADE) <sup>9</sup>	€1,057
Mean cost avoidance per intervention <sup>9</sup>	€166
Average time per intervention <sup>9</sup>	22.5 mins
Intervention rate (no of interventions/ no. of admissions) <sup>1</sup>	44.3%
Total Irish Hospital Admissions (inpatient) per year <sup>13</sup>	643,748
Assumed clinical pharmacy resources would have an “intervention time” utilisation factor of 80%	80%
Number of working days per year	219

<sup>1</sup> Calculation based on Gallagher et al.

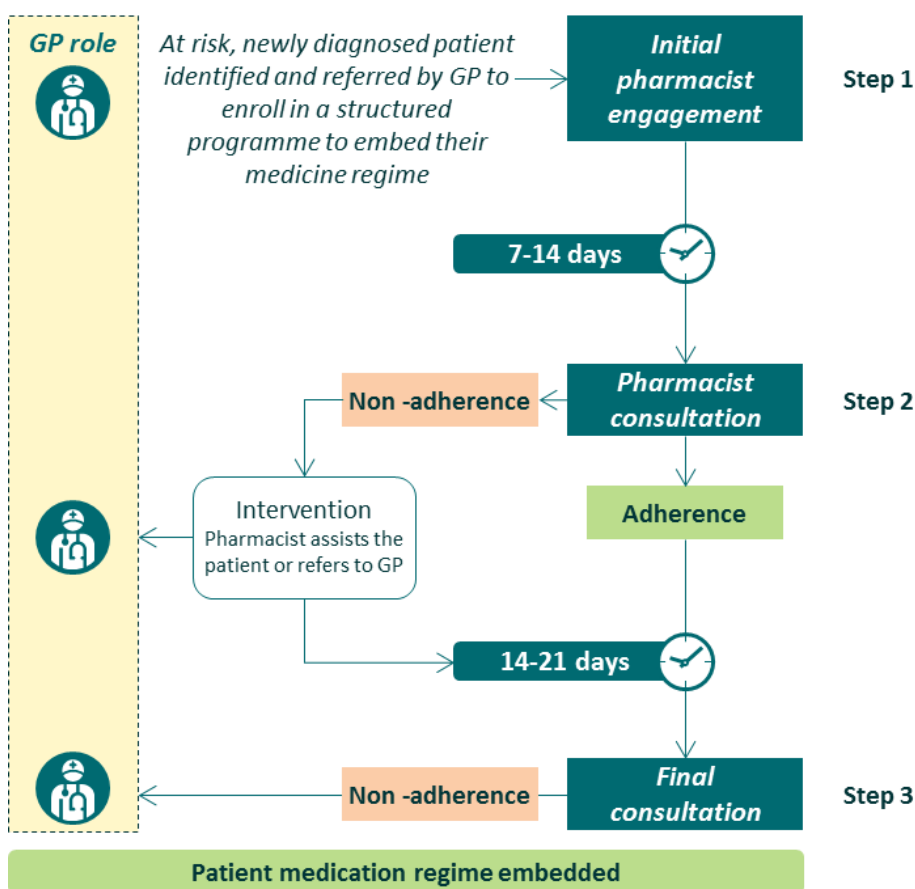
Calculation summary:

		<u>All hospitals</u>	<u>Secondary only</u>
<b><u>Cost avoidance:</u></b>			
Number of discharges pa		643,748	315,000
Intervention rate, per Gallagher et al	x	0.443	0.443
Number of interventions pa	=	285,180	139,545
Cost avoidance per intervention, per Gallagher et al	x	€166	€166
<b>Overall cost avoidance for all interventions</b>	<b>=</b>	<b>€47,339,940</b>	<b>€23,164,470</b>
<b><u>Cost of service delivery:</u></b>			
Days worked pa		219	219
Intervention hours worked per day (6.95 hours by 80% utilisation)	x	5.56	5.56
Average time per intervention (hours) (or 22.5 mins), per Gallagher et al	/	0.375	0.375
Number of interventions per pharmacist pa		3,247	3,247
Number of WTE pharmacists required to deliver all interventions per annum (excluding discharge review)		88	43
Cost pa per pharmacist	x	€81,942	€81,942
<b>Overall cost to provide all interventions</b>	<b>=</b>	<b>€7,210,896</b>	<b>€3,523,506</b>
<b>Net cost avoidance</b>		<b>€40,129,044</b>	<b>€19,640,964</b>

## 4. Case Study 2. Medicines Optimisation Services - Newly Diagnosed Patients Chronic Disease – Structured Support to Optimise Therapy

Implementation of structured introduction to medicines has been most notable in the UK whereby a service has been implemented nationwide to provide a systematic, structured introduction to new medicines for chronic disease patients including those with cardiovascular disease, asthma, chronic obstructive pulmonary disease (COPD) and diabetes. The purpose of this service is to improve the levels of compliance for those who have received a medical prescription (adherence) which, for conditions such as asthma, can be as low as 67%. An evaluation of the service, which was introduced in 92% of community pharmacies in England, forms the basis for a quantification of the potential cost effective implementation of a similar service in Ireland<sup>14</sup>.

Figure 8: Outline of the process for structured introduction to new medicines



Of the chronic diseases included in the service, asthma was chosen for full examination to estimate the scale of benefit that could be achieved in Ireland. Asthma has particularly high levels of patients,<sup>15</sup> and an estimated 54% (240,000)<sup>16</sup> of patients having an “uncontrolled” asthma condition. This has profound results given Ireland has the fourth highest prevalence of asthma globally, with 5,000 hospital admissions a year and 20,000 asthma related Emergency Department attendances per year. Asthma results in one death per week in Ireland, 90% of which are preventable.

In line with professional requirements, the pharmacist currently provides information to the patient, an introduction to the patient’s new medicine,

demonstrates correct inhaler technique, and educates the patients on self-management of the condition for each supplied medicine.

In the proposed services, the patient attends further consultations with the pharmacist to discuss the medication regime, inhaler technique and any issues with adherence or optimal use of the medicine several days after the patient has started their new medicine regime. The pharmacist clarifies any outstanding issues or refers to the GP if necessary. The patient receives a final consultation with the pharmacist several weeks afterwards to ensure the medication regime is embedded.

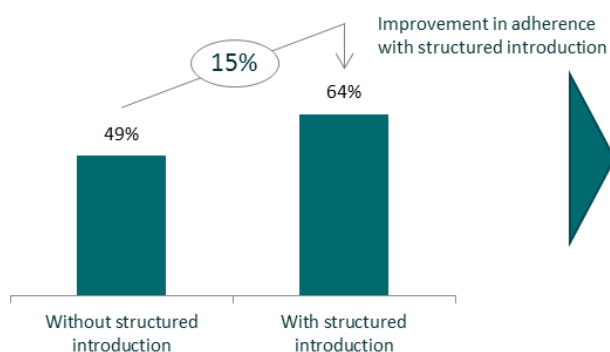
In considering the impact of implementing a structured introduction to a medicine, the health state and associated cost of treatment of those participating in the initiative must be taken into account. As per findings in the review of the UK-based service<sup>17</sup>, the probability of transitioning from a state of poorer health to better health can be measured with or without the structured introduction initiative, thus quantifying the counterfactual level of adherence. Where the aim of the initiative is to successfully control asthma so as to reduce the severity of acute exacerbations of asthma, outcomes are measured based on the change in probability of adherence. Successful outcomes of improved adherence are measured as

- Improved probability of asthma treatment being conducted outside of a primary or secondary care setting;
- The increased number of patients with “successful control” – broadly for symptoms to be apparent on less than two days a week, with morning expiratory flow being >80%.

The aims of this service are in line with the HSE National Clinical Programme for Asthma objectives to maximise the number of patients with asthma whose asthma is controlled.

Figure 9: Adherence improvement and costs of non-adherence<sup>17</sup>

#### Likelihood of adherence to inhaler regime



Estimated weekly costs of asthma treatment at control levels*	
<i>Successful control</i>	€16.60
<i>Sub-optimal control</i>	€43.40
<i>Primary-care managed exacerbation</i>	€131.20
<i>Hospital managed exacerbation</i>	€2,500.70

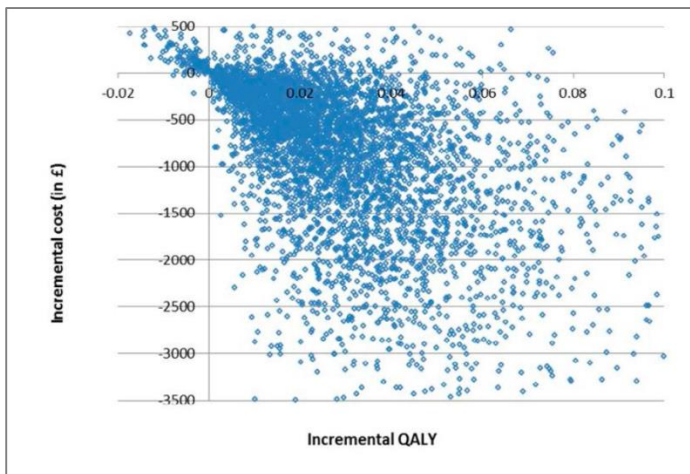
\* The monetary values quoted are the study equivalent in euros based on current £/€ exchange rates.

#### Cost Effectiveness

Translating findings into an Irish context, an average cost avoidance of €1,466<sup>2</sup> (over the course of an average patient’s life) could be achieved for every asthma patient taking part in the programme with each patient gaining 0.04 Quality Adjusted Life Years. By calculating the average age of asthma diagnosis, and the associated average life expectancy of the patient, it is estimated that return (in terms of cost avoidance) attributable to the scheme (as applied to asthma) achieves payback on initial investment in a little over one year, if the scheme is universally implemented.

<sup>2</sup> As per Elliot et. al, calculated based on €/£ exchange rates on 06/04/2016.

Figure 10: Incremental cost effectiveness plane for structured interventions for asthma patients<sup>17</sup>:

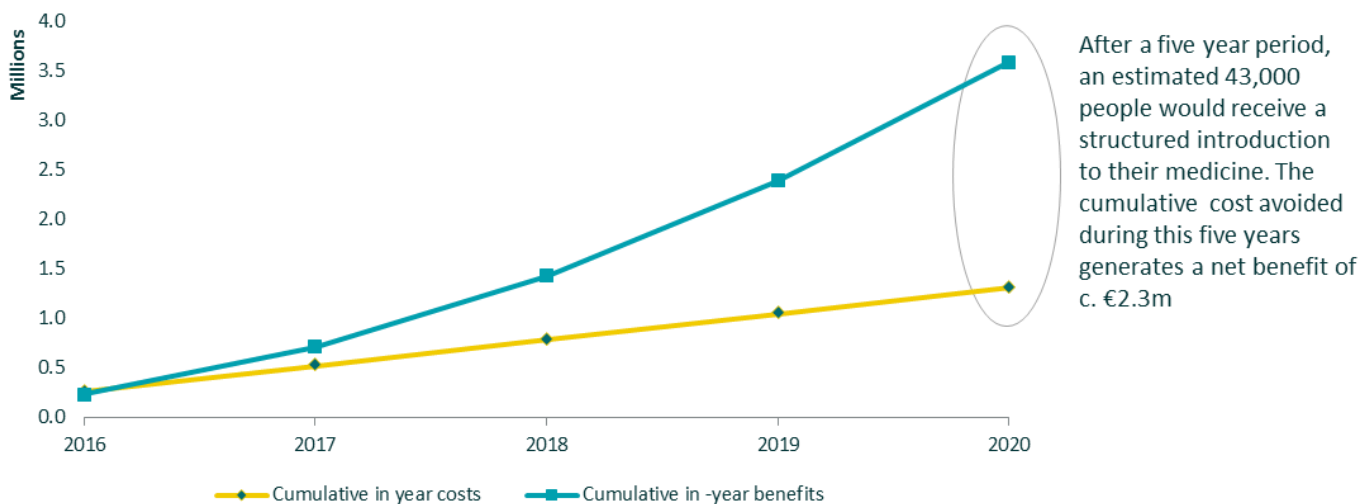


The estimated potential outcome of the introduction of the scheme in an Irish context would have the following broad characteristics:

1. The **number of structured medicine introductions** a year would be c. **8,600** if the entire population were covered.
2. At €30.60 per patient (indicative cost based on UK study prices only) the investment requirement would be approximately €263,000 per year which would yield an average cost avoidance of €1,466 over the lifetime of the patient.
3. This would result in a net saving per year of each patient’s remaining life of €27.80, with an average remaining patient lifetime of 52.6 years
4. Taking a 5 year view of total population benefits this initiative, 43,000 people would receive the service generating a net cost avoidance of €2.3m over the period (calculation outlined with assumptions at the end of this section)

Figure 11: Five year costs and benefits of structured medicines introduction for Irish asthma patients.

**Estimated potential five year costs vs benefits of structured medicines introductions for Irish asthma patients (€m)**



## Other chronic illnesses

Asthma as a case study represents a high level of cost avoidance which would be applicable to Ireland's estimated 450,000 asthmatic patients, 54% of whom have uncontrolled asthma<sup>18</sup>. The review of the New Medicines Service adopted for five illnesses in the UK concluded that the intervention has a 10-15% improvement in patients' adherence at a small service cost, which translates into modest health gains and significant cost avoidance in the long term. Each chronic disease would need to be assessed separately to determine its potential in the Irish health system.

### *Summary of service opportunity*

#### *Patient issue*

Non adherence to newly prescribed medication regimes causing poor health outcomes over the lifetime of the patient.

#### *Intervention proposed*

A structured introduction to medicine regimes for chronic illnesses via three structured consultations with the pharmacist in the first three weeks of the regime. Non-adherence is intervened through a collaborative approach between the pharmacist, the GP and other healthcare professionals.

#### *Benefit to patient*

A 10-15% increase in the probability of adherence to the medication regime and thus better disease control.

#### *Benefit to wider health system*

A potential cost avoidance due the avoidance of treatment costs in later life. In the case of asthma, this equates to a €1,466 saving over the lifetime of the average patient for a relatively small intervention cost.

Taking a 5 year view of total population benefits this initiative, 43,000 people would receive the service generating a net cost avoidance of €2.3m over the period (calculation outlined with assumptions at the end of this section)



## Core Assumptions

Proportion of all asthma patients requiring a preventer inhaler (Beclomethasone or substitutes)	75% <sup>19</sup>
Number of newly diagnosed beclomethasone patients per year <sup>20</sup>	8,607
Average age of newly diagnosed patient <sup>20</sup>	28.1
Average Irish life expectancy <sup>21</sup>	80.8
Euro cost of performing the entire introduction to the medicine <sup>3</sup>	€30.60
Average net cost avoidance per patient (lifetime value) <sup>17</sup>	€1,466
Average QALY increase per patient <sup>17</sup>	0.04
Average one year benefit of NMS per patient	€27.80

Note: The five-year assessment of the implementation of this initiative has not discounted the benefits accrued in years after the first year of implementation.

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<sup>3</sup> UK cost used as an illustrative proxy. The cost includes all necessary consultations to complete the structured introduction

Calculation summary:

	<u>Per Patient</u>	<u>Number of patients</u>	<u>All Irish Asthma Patients</u>
<b><u>Cost avoidance:</u></b>			
Average cost avoidance (in total) over a patient's life (per Elliot et al, UK study)	€1,466	8,600	€12,607,600
Average post diagnosis life expectancy, in years	/ 52.6		52.6
<b>Average cost avoidance pa over post diagnosis life</b>	<b>= €27.87</b>		<b>€239,688</b>
<b><u>Cost of service delivery:</u></b>			
Indicative cost, per UK study (at stg£25)	<u>€30.60</u>	8,600	<u>€263,160</u>
Net cost avoidance - in the year of service delivery	<u>-€2.73</u>		<u>-€23,472</u>
Net cost avoidance - each year thereafter (at current prices)	<u>€27.87</u>		<u>€239,688</u>
<b>For example, over 5 years the next cost avoidance (for this group of 8,600 patients) would be:</b>			
Average cost avoidance pa over post diagnosis life	€27.87		€239,688
By 5 years	x 5		5
Total cost avoidance, over a 5 year period, post diagnosis	= €139.35		€1,198,440.00
Total cost of service delivery - indicative based on UK study	<u>€31</u>		<u>€263,160</u>
	<b><u>€108.35</u></b>		<b><u>€935,280.00</u></b>

Note: This calculation is then made for all patients receiving the structured introduction programme over the five-year period, to include all of the cost within the period but only the benefit accrued within those five years.

## 5. Case Study 3. Pharmacist Medication Optimisation for Patients in a Nursing Home Setting in Collaboration with the Nursing Staff, Patient and Patient's GP

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Given the rapid growth of nursing home residents forecast in the short to medium term, coupled with the increasing incidence of polypharmacy which is closely linked to levels of potentially inappropriate prescribing (PIP), there is an opportunity for current and future patient health improvement and health system cost reduction through systematic reviews of prescribing for 'at risk' older patients in nursing homes.

### Proposed service

The proposed service is in line with HIQA standards<sup>22</sup>, where each resident is afforded the opportunity to consult with his/her pharmacist. The standards also specify that medication reviews for each resident should take place at specified intervals and findings documented in the patient's care plan.

A pharmacist would conduct a medication review for 'at risk patients' (those with incidence of polypharmacy) in Long Term Residential Care (LTRC) settings in conjunction with their medical practitioner, and nursing staff.

The opportunity is outlined on the basis of preventing potentially avoidable adverse drug events experienced by those patients who are at risk, in this case those who:

- Are residents in Long Term Residential Care (LTRC) and;
- Have an incidence of polypharmacy ( $\geq 5$  medicines) or excessive polypharmacy ( $\geq 10$  medicines)

The medication review should take into consideration the patient's health status and medications, with access to full medical and care records, in conjunction with a consultation with the patient and their carer. The review would likely follow the widely endorsed methods of The Screening Tool of Older Persons' potentially inappropriate Prescriptions (STOPP) – a practical methodology that identifies cases of PIP, and The Screening tool to alert doctors to Right Treatment (START). These were thought to be most effective at identifying PIP that caused adverse drug reactions, and in identifying the widest range of potential drug cost reductions.

This service is designed to achieve three broad outcomes:

1. Health benefits to the patients demonstrated by a reduced number of adverse drug events or general improvement in the wellbeing of the patients<sup>23</sup> and reduce inappropriate polypharmacy.
2. Cost avoidance in the prevention of adverse drug events (readmissions, further treatment requirements etc.), many of which are avoidable<sup>24</sup>.
3. Cost reduction in terms of a reduction of the number and value of medicines, which were unnecessarily part of the patient's treatment regime.

The medication reviews would be, structured, systematic and targeted, focusing on medication optimisation beyond the standard pharmaceutical review undertaken by the community pharmacist as part of the dispensing process. This would offer an opportunity to review trends for taking medication,

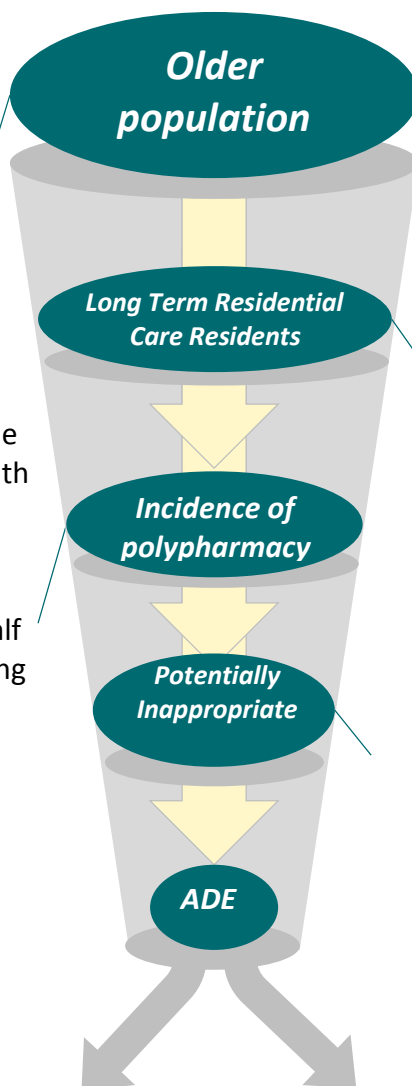
review of pain medication, appropriate formulations, inhaler technique, and blood test results, in collaboration with a GP. Any changes to therapy / formulations would be agreed collaboratively with the GP, and suggested adjustments to a patient's prescription / Kardex would then be implemented by the GP after they had reviewed the suggested intervention.

**Quantifying the potential benefit of introducing the service nationally (see calculations in tables A-H supported by assumptions)**

Figure 12: The number of older nursing home residents with polypharmacy, and potentially inappropriate prescribing

Ireland's older (>65 years) population is growing at a rapid rate with over 3% annual growth in the population over the age of 65. As life expectancies increase, the older proportion of the population will jump from 12% in 2016 to 22% of the total population by 2041<sup>32</sup>.

Older people in LTRC are a vulnerable at-risk category of patients, often with multiple medicines regimes. The incidence of polypharmacy ( $\geq 5$  medicines) in older residents has quadrupled since 1997, with over half of Irish nursing home residents having an incidence of polypharmacy<sup>28</sup>.



This ageing population will be cared for in their own homes as long as possible, however if current Long Term Residential Care (LTRC) requirements by age cohort remain the same, up to 36,000 older people will require nursing home care by 2021, and potentially 44,000 by 2026<sup>33</sup>.

Polypharmacy has been shown to be a strong predictor of Potentially Inappropriate Prescribing (PIP) amongst this older population. Up to 36% of Irish older patients receive a prescription that is potentially inappropriate<sup>34</sup>.

**Health impacts**

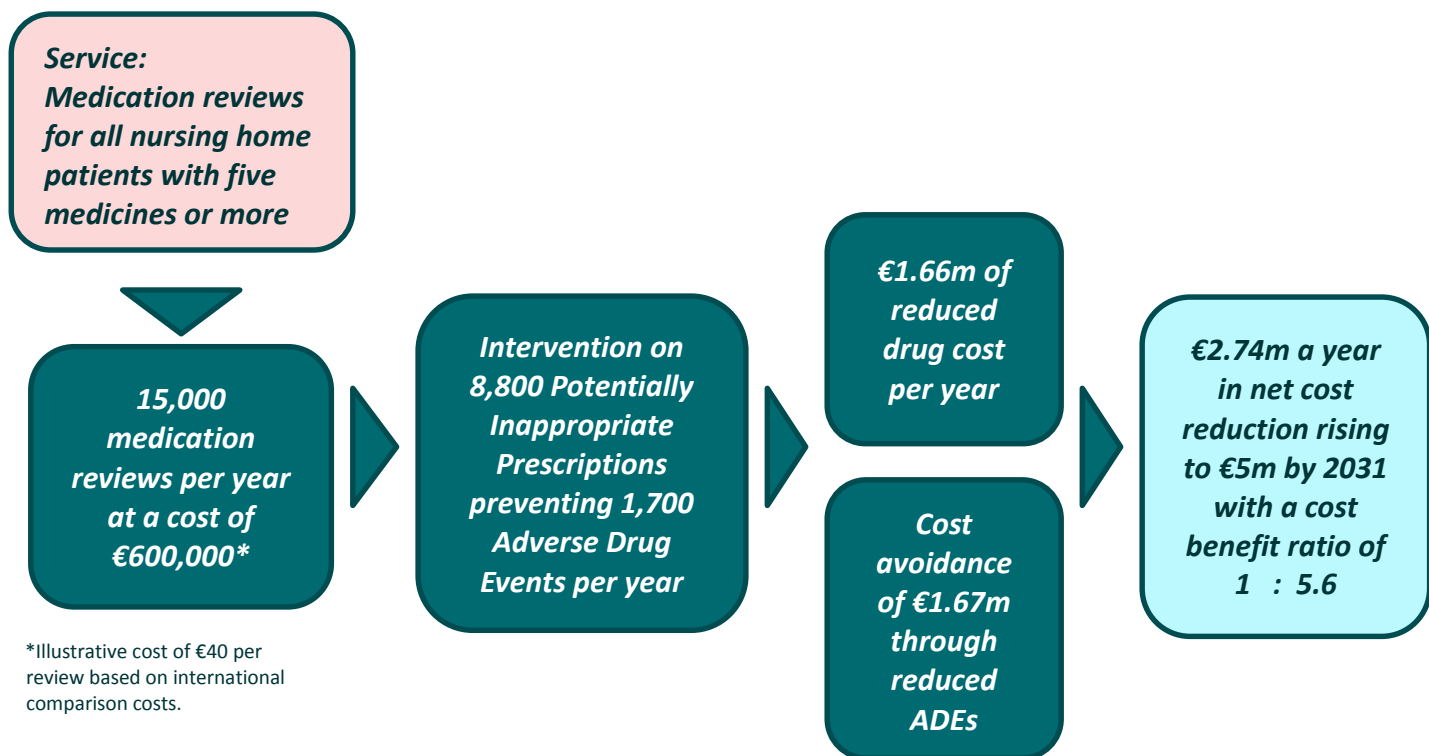
Negative health impacts of inappropriate prescribing can be significant with increased likelihood of hospitalisation  
 Patient quality of life can also be reduced through an increased number of falls and/ or exacerbation of existing conditions.

**Reduced cost impact of PIP and ADE (Adverse Drug Event) cost avoidance**

PIP costs can be quantified in terms of  
 a) The costs of unnecessary drugs that are part of existing sub-optimal medication regimes;  
 b) The cost avoidance as a result of reduced hospital admissions and /or further treatment as a result of ADEs

The following opportunity overview quantifies the potential costs and potential benefits of the implementation of an annual review, for those patients with polypharmacy.

Figure 13: Potential cost reductions and cost avoidance from the introduction of medication reviews in Nursing Homes:



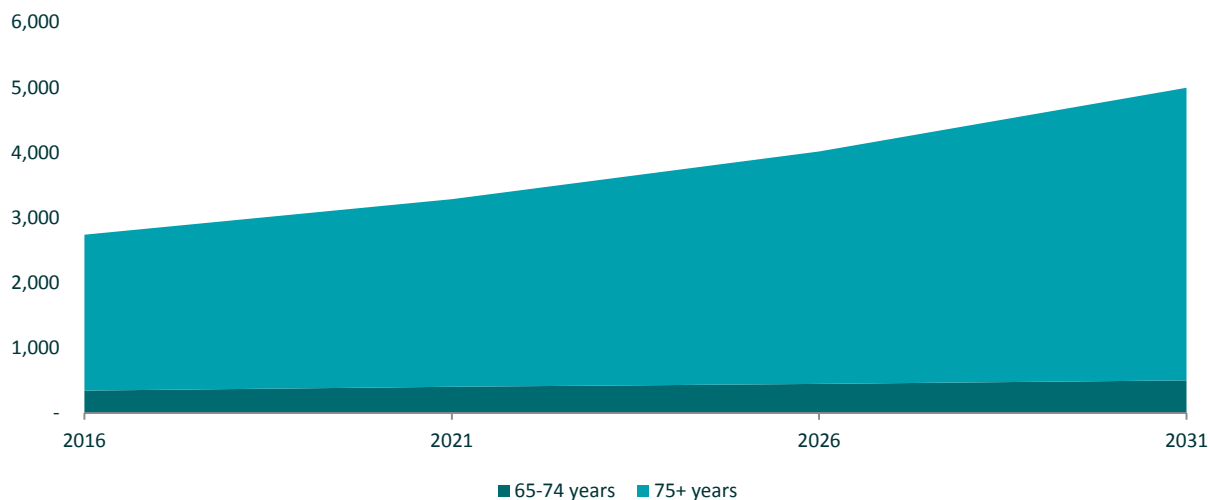
Broad and conservative estimates of the potential opportunity of pharmacist annual reviews in nursing homes indicate that if a medication review was conducted are cost of €40 for each of these at-risk patients, there may be approximately 8,800 potentially inappropriate prescriptions identified, 20% of which, if not addressed, could develop into cases of adverse drug events.

This is conservatively calculated based on a low probability of hospitalisation as a result of the PIP. If hospitalisation were to be of higher likelihood, the average cost per event could rise to €1,500<sup>25</sup> depending on assumed lengths of stay.

Based on the estimates above, the cost / benefit ratio indicates that for every €1 spent on medication reviews in Nursing Homes, €4.30 could be saved through drug cost reduction and other health system cost avoidance (hospital admission etc.). This net benefit would rise rapidly given the growth of the >75 age category and their associated level of polypharmacy.

Figure 14: Growth in cost benefit 2016-31

**Total potential benefit by age category of Nursing Home resident (000s)**



*Summary of service opportunity*

***Patient issue***

The increase risk of adverse drug reactions / events due to multiple medications ( $\geq 5$ ) and potentially inappropriate prescribing in Irish nursing homes.

***Intervention proposed***

An annual multidisciplinary structured medicines review for older residents of Long Term Residential Care who are prescribed 5 medicines or more to identify and reduce inappropriate prescribing and limit associated potential Adverse Drug Events.

***Benefit to patient***

Improved health outcomes in terms of reduced likelihood of hospitalisation, and ongoing poor health.

***Benefit to wider health system***

1. Potential cost reduction associated with reduced number of medication being consumed
2. Potential cost reduction based on reduced Adverse Drug Events and the potential hospitalisation that can result from these ADEs. This cost is estimated at €2.74m per year.

Core assumptions underpinning calculations:

<i>Prevalence of polypharmacy<sup>26</sup></i>	<i>Age group</i>		
	<i>50-64 years</i>	<i>65-74 years</i>	<i>75+ years</i>
<i>Male</i>	9%	26%	38%
<i>Female</i>	11%	26%	36%

<i>Average Polypharmacy prevalence in nursing home<sup>27</sup></i>	49%
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Note: Polypharmacy = 5 or more medicines

Note: Prevalence is assumed fixed for the duration of projections

<i>LTRC requirements by age group</i>	
<i>65-69 years</i>	0.70%
<i>70-74 years</i>	1.50%
<i>75-79 years</i>	3.70%
<i>80-84 years</i>	8.40%
<i>85+ years</i>	22.29%
<i>Note: LTRC requirements are assumed fixed across projections</i>	

<i>Pip Prevalence in Nursing home residents with &gt;5 medications</i>	59.8% <sup>28</sup> ,
<i>Cost of PIP per patient</i>	€ 189.5
<i>Cost of review</i>	€ 40.0 <sup>29</sup>
<i>Number of reviews per year</i>	1

<i>Total ingredient cost for PIP (2007) excl pro re nata (as required) per patient with PIP</i>	€ 344.6 <sup>30</sup>
<i>Adjustment for 2016 pricing conditions: Estimated % reduction in drug cost since the introduction of reference pricing<sup>31</sup></i>	45.0%
<i>Estimated value reduction in cost since study (reference pricing + generic)</i>	€ 155.1
<i>Total ingredient cost avoidance per PIP after adjustment for reference pricing</i>	€ 189.5

<i>Likelihood of an ADR / ADE with at least 1 PIP</i>	19.5%
<i>Cost of ADE<sup>32</sup></i>	€ 963 <sup>25</sup>



Calculation summary:

**All Nursing  
Homes**

**Cost avoidance:**

**(A) PIP**

Long term residents in care			30,139
Number of Nursing home residents with polypharmacy			14,768
PIP prevalence in Nursing home residents with polypharmacy	x		59.8%
Number of potential PIPs	=		8,831
Cost avoidance of PIP per patient	x		€189.50
Overall cost avoidance of PIPs	=		€1,673,475

**(B) ADE's**

Likelihood of ADE/ ADR with at least 1 PIP			19.5%
Number of potential PIPs	x		8,831
Number of potential ADEs	=		1,722
Cost of ADE	x		€963
Overall cost avoidance of ADEs	=		€1,658,286

<b>Overall cost avoidance for all interventions</b>	<b>=</b>		<b>€3,331,761</b>
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**Cost of service delivery:**

Number of LTRC patients			15,000
Estimated cost per review	x		€40.00
<b>Total cost of reviews</b>	<b>=</b>		<b>€600,000</b>

<b>Net cost avoidance</b>			<b>€2,731,761</b>
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