Diabetes- think, check, act: Economic Evaluation

1. Introduction

This paper provides an overview of the economic analysis undertaken to date of the Diabetes- think, check, act programme. This programme aims to improve inpatient diabetic care, specifically for patients admitted to acute hospitals with a secondary diagnosis of diabetes.

2. Background

The prevalence of diabetes in the Scottish population is 4.3% and it is estimated that 15-20% of inpatients have diabetes (National Diabetes Inpatient Audit 2010). 12% of Scottish inpatient expenditure is spent on patients with diabetes and inpatients with diabetes have a longer length of stay for almost all conditions that lead to hospital admission, compared to patients without diabetes.

3. Benefits

Improving the treatment of inpatients with diabetes has a number of expected outcomes. These include: timely assessment on admission, greater accuracy of insulin prescribing and reduced frequency and improved management of hypoglycaemia.

The economic impact assessment has focused on changes in treatment practice of Hypoglycaemic Episodes (HE) in two areas:

1. A reduction in the incidence of Hypoglycaemic Episodes (HEs)
2. An increase in the successful management of a Hypoglycaemic Episode.

The analysis has assessed the impact of improving these two indicators on patient length of stay.

The following assumptions were made based on the findings in the Diabetes- think, check, act test sites and from existing literature:

- Incidence of Hypoglycaemic Episodes can be reduced by 20% and that this leads to a length of stay (LoS) reduction of between 1 and 2.5 days.
- Successful management of Hypoglycaemic Episode can be increased by 50% (within the test sites, this varied between 41%-59%) and this leads to a LoS of 1 day.

The tables on page 2 illustrate the metrics used to identify changes in HE treatment in the pilot areas from 2011 to 2013. The observed differences in outcomes between 2011 and 2012 and between 2011 and 2013 are statistically significant and identify both a **reduction in the rate of HE** as well as an **increase in the HE resolution rate**.

These improvements are generally accepted to be associated with reductions in Length of Stay (LOS), leading in turn to improvements in capacity, measureable in number of bed days (BD) released.

Table 1 - Adherence to HE treatment guidance 2011- 2013

Adherence to HE treatment guidance	**2011 Pre intervention**	**2012 During intervention**	**2013 Post intervention**	**Change 2011 to 2013**
CBG < 4mmol/L	852	994	929	
Repeat CBG within 60 mins	335	753	856	
Proportion of CBG <60 mins	39.3%	75.8%	92.1%	**52.8%**

The data identifies a **52.8%** improvement in adherence to guidance for 2011 to 2013 (a HE is defined here as Capillary Blood Glucose (CBG) > 4mmol/L recorded within 60 min of initial identification of a CBG <4mmol/L).

Table 2 – HE resolution rates 2011- 2013

HE resolution rates 2011-2013	**2011 Pre intervention**	**2012 During intervention**	**2013 Post intervention**	2011 – 2013
HE resolved	208	463	537	
Clinical HE resolution rate	28.7%	65.7%	88.0%	**59.3%**

The data identifies a **59.3%** increase in HE resolution rates from 2011 to 2013

Table 3 Estimated bed days

Estimated bed days	**2011 Pre intervention**	**2012 During intervention**	**2013 Post intervention**	**2011-2013**
HE	725	705	610	
Bed days estimated	4,665	5,256	4,870	
Bed days per HE	0.16	0.13	0.13	**-19.4%**

The data indicates a **19.4%** reduction in bed days from 2011-2013

4. Assessing productive opportunities

A number of costs were used to identify potential productive opportunities associated with the improvements achieved in the pilot areas:

- a range of net total inpatient costs were used from the 2013 cost book, including the Scottish and Greater Glasgow and Clyde average across all specialties
- a range from smallest cost per bed day (general medicine, excluding geriatric assessment) to biggest cost (cardiac surgery) for Glasgow.

4.1 Impact of the Reduction in rate of HE

In 2013 there were:

- 1.82 million recorded inpatient bed days in Greater Glasgow and Clyde (excl. geriatric assessment)
- HE rate was approximately 14,500

The table below illustrates the potential productive opportunity when applying the range of assumptions and range of costs to a 20% reduction on the rate of HE.

Table 4 Potential Productive Opportunity 20% reduction on the rate of HE

HE incidence reduced by 20%	**Cost per Bed day**	**1 bed day**	**2.5 bed days**
Scotland average	585	1.69	4.23
Glasgow minimum	361	1.05	2.61
Glasgow average	502	1.45	3.63
Glasgow max	2,445	7.07	17.68
Number avoided bed days		**2,900**	**7,200**

A 20% reduction on the rate of HE for Greater Glasgow and Clyde is therefore estimated to result in a reduction of between 2,900 and 7,200 bed days and therefore a potential productive opportunity of between £1.05 million to £17.68 million.

When using the net total average Scottish inpatient the cost is between £1.69 m and £4.23 m. It is hoped that estimates will be made more precise once the case-mix of the pilot is matched to inpatient cost for case matched specialities.

4.2 Impact of increase in HE resolution rate

In Greater Glasgow and Clyde the HE resolution rate in 2013 was 32%. Given the assumption that a 50% increase in Hypoglycaemic Episode resolution rate is achievable (with a range of 41%-59%) and using the same bed day cost range as before, the following set of estimates is illustrated in Table 5

Table 5 – Increase in HE resolution

Increase in SHE resolution		min	average	max
rate increase		41%	50%	59%
new resolution rate		73%	82%	91%
number of avoided BD		6,000	7,200	8,500
Avoided BD cost range	£ per BD	£m	£m	£m
Scotland average	£585	£3.51	£4.23	£4.95
Glasgow min	£361	£2.17	£2.61	£3.06
Glasgow average	£502	£3.01	£3.63	£4.25
Glasgow max	£2,445	£14.66	£17.68	£20.71

Therefore an increase of the rate of HE resolution of between 41% - 59%, leading to an overall resolution of between 73% and 91% of cases, is estimated to result in a potential **6,000 to 8,500 reduced bed days.** This would provide a potential productive opportunity of between **£2.17 million and £20.71 million** for Greater

Glasgow and Clyde**. (**when using the net total average Scottish inpatient cost or between £3.51 m and £4.95 m)

It should be noted that there will be overlap between the two effects and that these are therefore not cumulative. Also, it was decided not to take a bottom-up costing approach of cumulatively costing each HE, due to the number of underlying assumptions and due to difficulty in costing individual items this would entail.

5. Costs of interventions

When assessing economic impact and seeking to establish potential productive opportunities, it is important to identify the costs attached to implementing improvement interventions. There are both start-up as well as a recurring cost elements associated with the initiative and these are identified below.

5.1 Staff education intervention

In the Greater Glasgow and Clyde test sites; there has been additional staff education to ensure raised awareness of good diabetes treatment practice. A variety of approaches have been used. These range from small group teaching delivered by Diabetes Specialist Nurses (DSNs) for all ward staff, to a 'cascade' approach with DSN education being delivered to key 'diabetes champions'.

This education input subsequently reduced, however an estimate of the education time delivered to the pilot ward has been made, and this has been scaled up to identify the time it would take to implement education and awareness sessions across the total board area (total unique IDs used for scaling).

It is difficult to monetise these staff time costs as the cost will depend heavily on the type and number of staff being trained and any requirement for additional input.

Table 6 Staff Education Activity

Staff Education Activity	**Type of education**	**Requirement across GGC**
Low level of input	30 mins for diabetes champion on 43 bed ward and subsequent information cascade	51 hours of training
High level of input	120 mins for diabetes champions on 43 bed ward and subsequent cascade	203 hours of training

5.2. Increased referral rates

The pilot experienced an initial period of much higher referral rates followed by a period of lower referral activity, presumably as the ward became more confident in the appropriate management of diabetes. Table 7 identifies the amount of estimated time required to deal with additional referrals at pilot ward and across GGC level.

Table 7 Referral Rates

Patient Referral rates	Pilot Ward	Across GGC
High referral rates	1.5 hours per week	230 additional hours per week
Low referral rates	30 minutes per week	77 additional hours per week

5. 3. Dedicated project management time

Information on the allocation of labour towards project management type duties associated with the pilot was received from one DSN. The current allocation is estimated at 0.6 of a WTE Agenda for Change Band 6 (0.4 spent with patients; 0.1 spent managing the project and 0.1 on other activities).The total staff time needed would have to be extrapolated up, first for all staff involved with the running of the pilot, and secondly for a potential roll out across GG&C and Scotland.

The activity costs identified in this section need to be taken into consideration when planning for wider implementation of the programme, and adequate staffing and other resources need to be provided to ensure the sustainability of the programmes achievements.

Other areas for consideration out of scope

Patient experience - Although a reduction in harm and safer use of medicines are key expected outcomes from this intervention, no targeted patient survey is being conducted at this stage.

Indirect impacts - The evaluation also does not consider the wider impacts, such as prevention of co-morbidities (e.g. lesions).

Changes in medication - This is outside the project remit.

(Donnan PT; *Diabetes Care* 2000: 23(12):1774-9, Sampson MJ; *Diabetes Res Clinical Practice* 2007; 77; 92-98).

(Govan L; *Diabetologia* 2011:54(8):2000-8).

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