

# SMASH!

The Salford Medication Safety Dashboard

## 1 Introduction

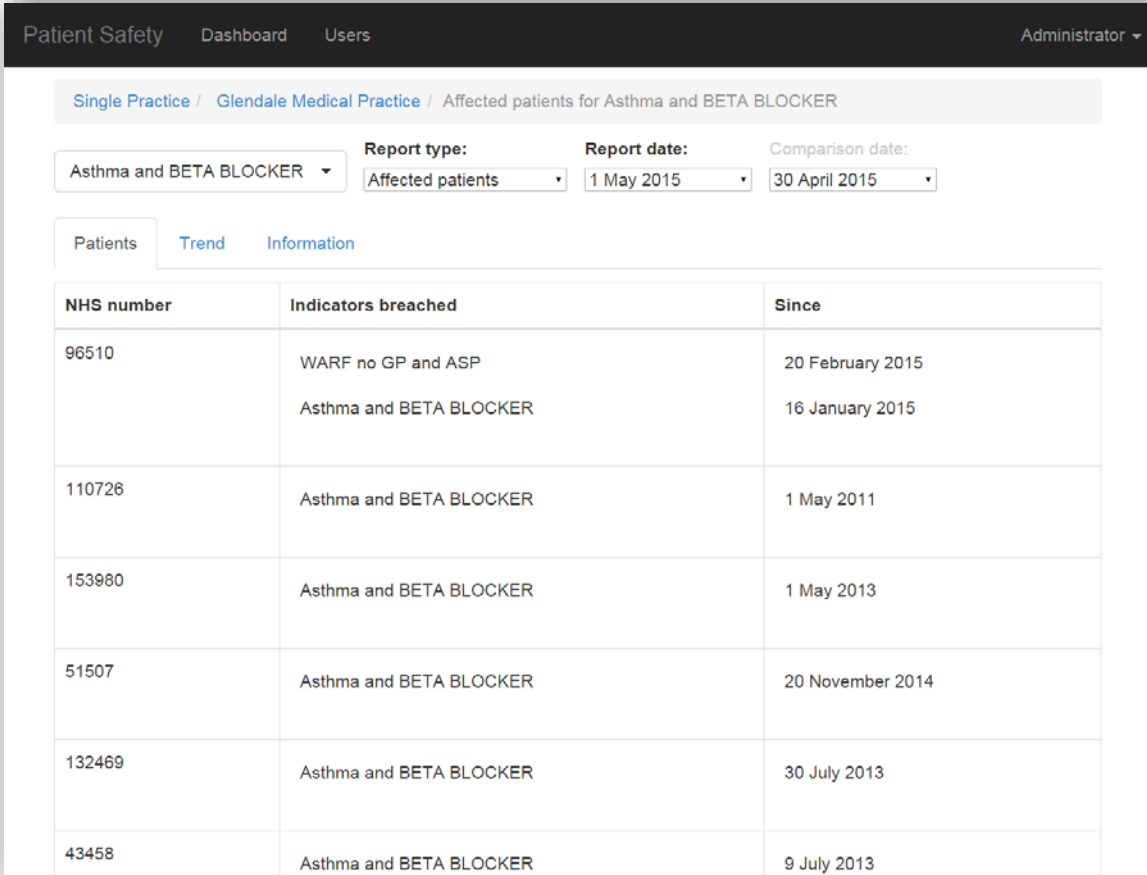
### 1.1 Background

A recent study of general practice identified errors in 5% of prescription items, with one in 550 items containing a severe (potentially life threatening) error<sup>1</sup>. Other studies have found that prescribing errors in general practices contribute to one in 25 hospital admissions<sup>2</sup>, and the costs to the NHS are about £500 million per year<sup>3</sup>. GP systems that try to block this via use of in-consultation pop-ups are frequently limited by “alert fatigue”. An alternative paradigm is to use electronic audit and feedback (AF) systems or dashboards to present results to clinicians after the event to allow review, and hopefully change. Despite the widespread usage of such dashboards there exists little evidence as to what factors contribute to their success or failure.

### 1.2 SMASH

The Salford Medication Safety Dashboard (SMASH) analyses patient records and uses advanced algorithms to detect patients who may be at risk due to the medication that they are receiving. Data from GP systems is processed, validated and analysed to produce a daily report, allowing health care professionals to always view up to date information. The reports contain lists of NHS number which are available to GPs and pharmacists via an intuitive web interface; they can then decide whether to take further action. The indicators are based on the widely adopted PINCER standard which has been shown to reduce prescribing errors in a cost-effective manner<sup>4</sup>.

Several screenshots are displayed below in Figures 1-5.



The screenshot shows the SMASH dashboard interface. At the top, there are navigation links for 'Patient Safety', 'Dashboard', and 'Users', along with a user role indicator 'Administrator'. Below this, the breadcrumb path is 'Single Practice / Glendale Medical Practice / Affected patients for Asthma and BETA BLOCKER'. The main content area features a search and filter section with 'Asthma and BETA BLOCKER' selected in a dropdown menu. To the right, there are fields for 'Report type: Affected patients', 'Report date: 1 May 2015', and 'Comparison date: 30 April 2015'. Below the filters, there are tabs for 'Patients', 'Trend', and 'Information', with 'Patients' currently selected. The main data is presented in a table with three columns: 'NHS number', 'Indicators breached', and 'Since'. The table lists seven patients with their respective NHS numbers, the specific indicators they have breached, and the date they were first flagged.

NHS number	Indicators breached	Since
96510	WARF no GP and ASP Asthma and BETA BLOCKER	20 February 2015 16 January 2015
110726	Asthma and BETA BLOCKER	1 May 2011
153980	Asthma and BETA BLOCKER	1 May 2013
51507	Asthma and BETA BLOCKER	20 November 2014
132469	Asthma and BETA BLOCKER	30 July 2013
43458	Asthma and BETA BLOCKER	9 July 2013

Figure 1 – A list of patients currently flagged by SMASH for the “Asthma and Beta Blocker” indicator

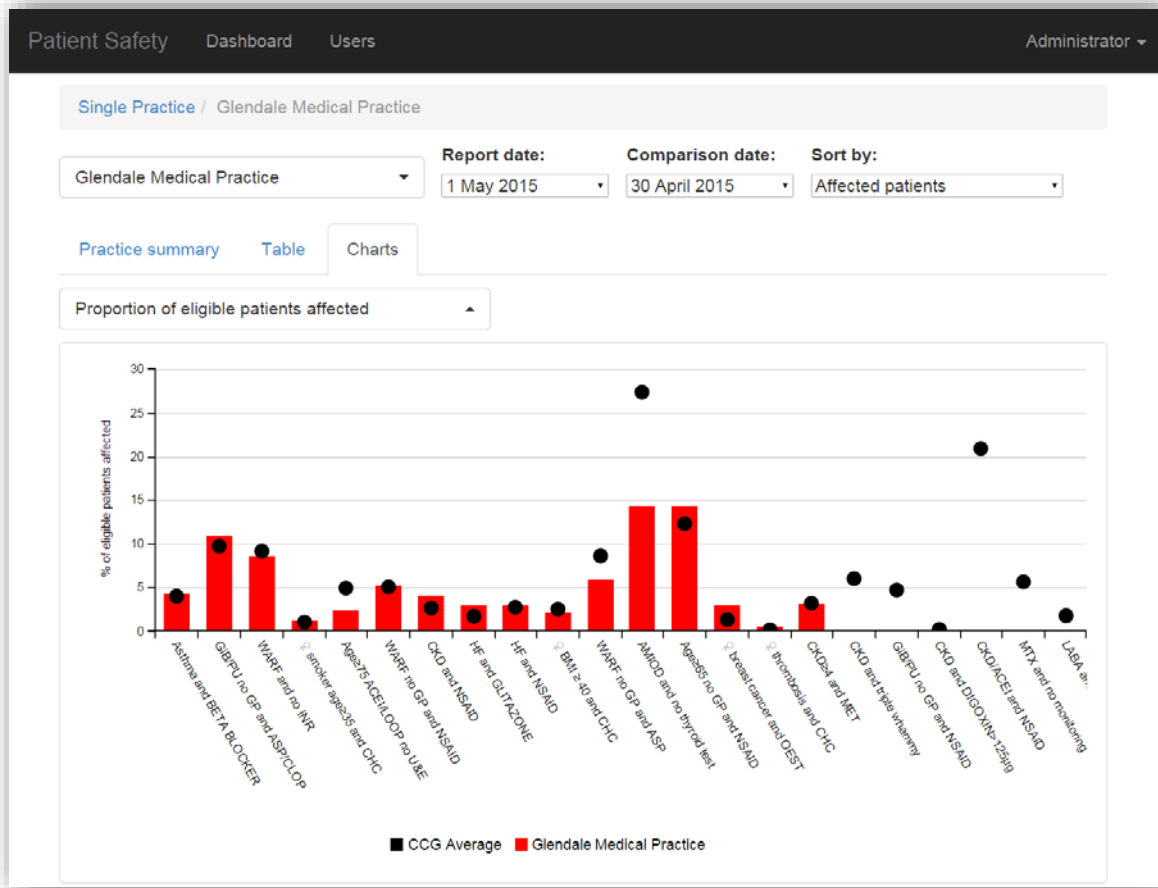


Figure 2 – Some users enjoy the ability to compare their performance with the CCG or local neighbourhood in order to prioritise their efforts

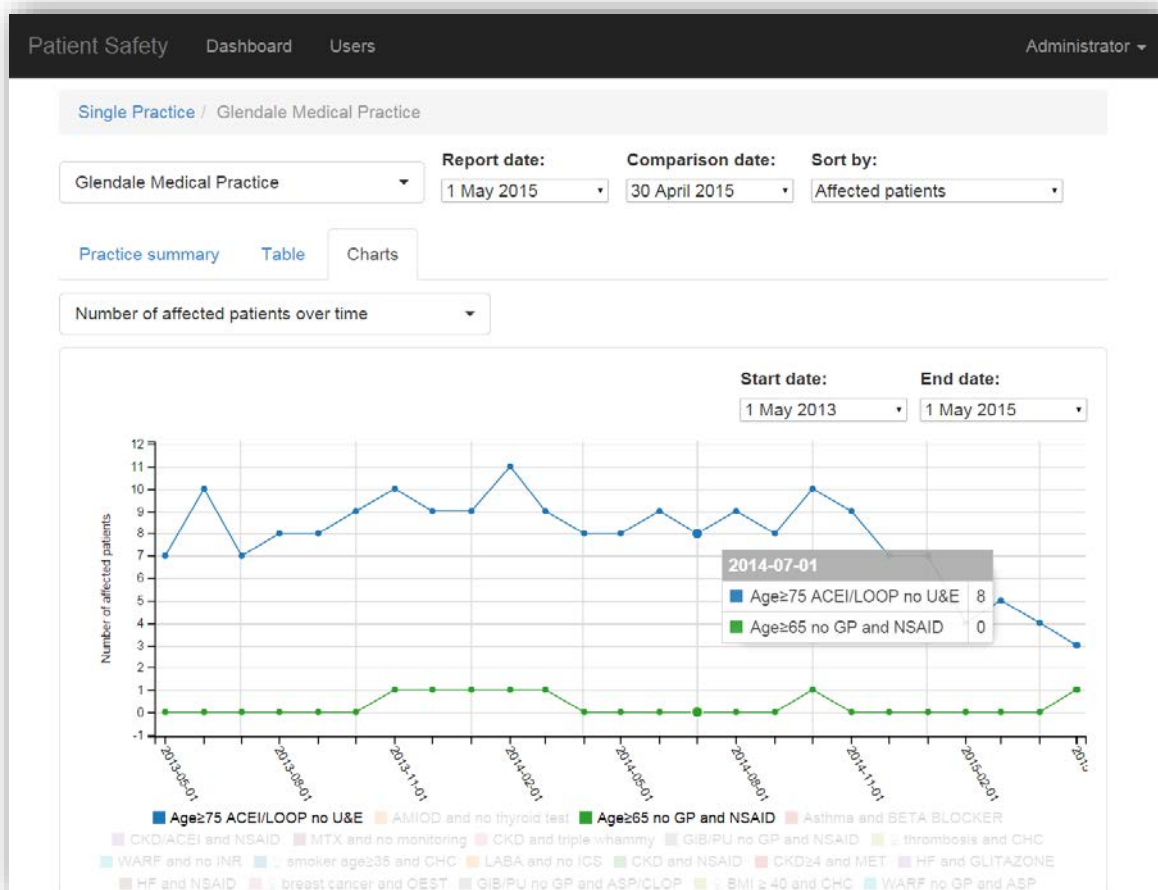


Figure 3 – Feedback showing a practice's improvement over time can enforce a positive feedback loop

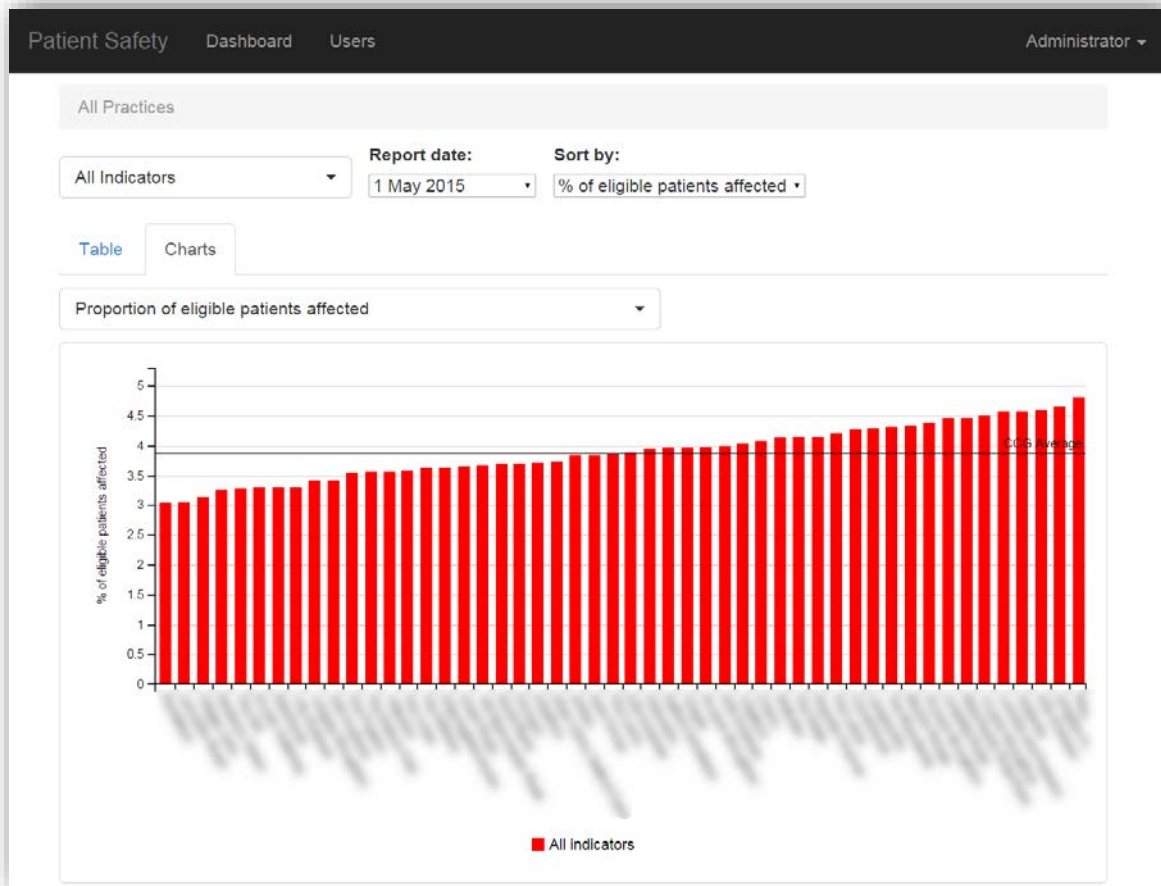


Figure 4 - CCG pharmacists can see which practices are doing well and badly to best focus scarce resources

The screenshot shows a dashboard for 'Patient Safety' with navigation links for 'Dashboard' and 'Users', and a user role of 'Administrator'. The main content area is titled 'Single Practice / Glendale Medical Practice / Affected patients for Asthma and BETA BLOCKER'. It includes filters for 'Asthma and BETA BLOCKER', 'Report type: Affected patients', 'Report date: 1 May 2015', and 'Comparison date: 30 April 2015'. Below these are tabs for 'Patients', 'Trend', and 'Information', with the 'Information' tab selected. The main content is titled 'Patients with a history of asthma who have been prescribed a  $\beta$  blocker' and includes a question 'What is the risk to patients?'. The text discusses the risks of  $\beta$  blockers in susceptible patients and provides advice from the Committee on Safety of Medicines. Another question asks 'What evidence is there that this pattern of prescribing is harmful?'. The text discusses the affinity of  $\beta$  blockers for  $\beta_1$ - and  $\beta_2$ -adrenoceptors. A table titled 'Table 1: Cardioselective and non-cardioselective betablockers' is included.

Cardioselective beta-blockers (relative selectivity for $\beta_1$ -adrenoceptors) <sup>2</sup>	Non Cardioselective beta-blockers (relative selectivity for $\beta_2$ -adrenoceptors) <sup>2</sup>
Acebutolol (2.4)	Labetalol (2.5)
Metoprolol (1.7)	Propranolol (8.0)

Figure 5 - Information is available to show the importance of each indicator, the risks, and the possible solutions

## 2 Method

The effectiveness and utility of SMASH is currently being evaluated in a trial. Each recruited practice is approached by a pharmacist who introduces the dashboard and explains the importance of the indicators. The pharmacist assists the practice for a few weeks, before leaving to work with another practice. Each practice is followed for 12 months from first pharmacist involvement, during which time we track all interaction with the dashboard down to individual mouse clicks and hovers. This invaluable source of data, combined with qualitative data obtained from interviews, will enable us to provide a list of best practice recommendations for the future development of such systems.

## 3 Results

We have recruited 45 (out of 46) of the general practices within Salford. The first practice recruited completed the 12 month follow up in March 2017, and the last practice recruited will complete in April 2018. The full and final analysis will be performed next year when all practices have completed the trial, but preliminary results are extremely promising.

Practices recruited prior to January 2017 (n=31) have seen the number of at risk patients fall by almost half from 1433 to 771. This is a mean reduction of 21.4 patients per practice and is significant ( $p=0.0006$ ) when compared with the mean reduction of 3.7 patients per practice recruited after January 2017 (n=14). Early data shows that while pharmacist usage decreases over time, the usage of other practice staff is constant, suggesting that the dashboard continues to be used after the pharmacist departs and that the number of at risk patients will remain low, rather than return to pre-study levels – a limitation of other pharmacist-led interventions<sup>1</sup>.

Interviews have shown that users of the system are extremely satisfied with the system and find it *“quick and easy”, “very user friendly”, “straightforward”* and *“miles more efficient”*. One pharmacist remarked that *“within an hour... you could have made quite an impact.”*

## 4 Future

The NIHR patient safety centre at Manchester has recently been awarded a further 5 years of funding. During this time, we will: improve the existing dashboard based on feedback from the trial; deploy more indicators; roll out the system across Greater Manchester; and, working with industry partners, explore ways of allowing patients to interact with the system. The ability for patients to discover when they are ‘flagged up’ by safety systems such as this will start to change the interactions between patient and provider, and opens up several interesting avenues for future research.

## 5 About me

Richard Williams is a senior software engineer and informatician working at the University of Manchester within the Greater Manchester Primary Care Patient Safety Translational Research Centre. Richard was the lead developer on the SMASH project and ensured that the system was built ahead of schedule, virtually bug free, and has attained an availability in excess of 99.9%. He is responsible for its future development and direction.

In addition to SMASH, he has designed, built and implemented several other web applications and their associated infrastructure: the award-winning COCPIT for analysing patient adherence to care pathways<sup>5-7</sup>; an application for simulating disease progression at a population level; and e-Labs for combining cohort data for increased statistical power. Richard is currently working towards a PhD on the gap between “routinely collected” and “research ready” datasets.

## 6 References

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