It is well known that patients with mental health disorders have shorter life spans and excess mortality due to physical illness. Regular and comprehensive physical health monitoring in this group of patients is therefore vital. Use of prescription drugs is the most common cause of hyperprolactinaemia, with ‘prolactin-raising’ antipsychotics increasing plasma levels up to 10-fold or more above pre-treatment values. In fact, the prevalence of hyperprolactinaemia among patients treated with antipsychotics was found to range from 56% to 67% for females and between 42% to 70% for males. Rates were even higher among women of childbearing age and patients on risperidone monotherapy. Persistent hyperprolactinaemia can have adverse effects including sexual dysfunction, menstrual disturbance, galactorrhoea and suppression of the hypotalamic-pituitary-gonadal axis. Long-term effects include decreased bone mineral density and possible increase in breast cancer.

Physical health monitoring has increasingly been a priority in psychiatric settings, as reflected in Central North West London NHS Foundation Trust (CNWL) commissioning standards. The Trust also has clear clinical guidelines on prolactin monitoring. ‘Management of Antipsychotic Induced Hyperprolactinaemia’ describes ‘prescriber responsibility to ensure that all patients prescribed an antipsychotic have baseline prolactin levels at the start of therapy’ that complement the general guidance such as the Maudsley Prescribing Guidelines.

If detected in monitoring, hyperprolactinaemia can be managed per the recommended guidelines. Interpreting prolactin concentration indicates when to consider re-testing or further investigations. To prevent or alleviate the condition, tailoring an antipsychotic drug regimen to each individual patient is essential and switching to a non-prolactin elevating drug, adding aripiprazole to the existing treatment or adding a dopamine agonist for patients who need to remain on a prolactin elevating drug, are recommended options to consider.

There was anecdotal evidence that prolactin was not being ordered with other routine blood tests and that there was a lack of...
knowledge of CNWL guidelines on the subject. Thus an initial audit was done to evaluate baseline compliance and ascertain whether improvement work was required. Following the first audit, a second round of data collection was carried out which showed further deterioration in performance, indicating that the interventions following the first were insufficient. This led to a Quality Improvement Project (QIP).

The analysis of blood samples for patients treated at St Charles Hospital were being conducted off-site, by the laboratory of a neighbouring acute trust. The blood request form in use was tailored to medical settings rather than psychiatric ones and did not specifically list the prolactin test as an option. This was taken into account when a further intervention was planned by developing a ‘Prolactin yes / no’ stamp to be stamped on all the ‘chemical pathology and immunology’ blood forms, reminding the doctors to consider this test.

Aims and objectives
1. To find out if prolactin is requested with baseline blood tests, as per Trust guidelines.
2. To improve the management of patients on antipsychotics through better physical health monitoring.
3. To find out if the intervention of the new prolactin stamp improved clinical practice and adherence to the Trust guidelines and whether this was a sustainable change.

Methodology
The criterion for the initial audit, in the CNWL guidelines, ‘Management of Antipsychotic Induced Hyperprolactinaemia’, states that ‘patients admitted to adult wards and treated with antipsychotics must have their baseline prolactin blood levels measured’.9 The standard was initially set at 90% since this was felt to be an ambitious but hopefully achievable target for an inpatient baseline measure.

To establish a baseline for the use of prolactin level tests, the project was conducted at St Charles Hospital on all the adult psychiatric wards, including the two psychiatric intensive care units, for all newly admitted patients prescribed antipsychotics. All patients admitted in the time frames of the project (July 4–17, 2011; January 16 – February 16, 2012; August 15–28, 2012, November 9 – December 6, 2012) who were prescribed antipsychotics were identified and comprised the respective QIP samples.

All data were collected from the electronic patient records. A period of two weeks after admission was allowed for conducting the initial blood test and documenting the results in the electronic record. Those patients who did not have their blood tests because they were transferred from the wards or discharged within two working days, ie prior to the tests being done, were excluded from the sample. If according to records a patient refused blood tests then they were also excluded from the sample.

Following the first round of data collection, results of the project were disseminated to doctors via presentations at academic meetings and by e-mails to ward doctors. The second round of data collection was then conducted and the results of this round were also disseminated through the same means as the first.

After the second round, a stamp which read ‘Prolactin yes / no’ was developed and stamped on the pathology request forms. The stamps were to serve as a reminder for all the doctors requesting routine baseline bloods for new admissions to consider whether the patient requires baseline prolactin blood test as per the guideline. The stamp read ‘yes / no’ to ensure the tests were requested only for those patients it was warranted for. The stamps went into effect on August 7, 2012 across the hospital’s adult psychiatry wards and the relevant staff informed.

The third and fourth rounds of data collection were conducted using the same method as the first two, but with the additional aim of ascertaining whether the new stamp contributed to improved clinical practice and adherence to the guidelines. The results from these rounds of data collection were also disseminated.

Criterion
Patients admitted to adult wards and treated with antipsychotics must have their baseline prolactin blood levels monitored, in accordance with Trust guidelines.

Audit standard
At least 90% of all patients admitted to adult wards and treated with antipsychotics must have their baseline prolactin blood levels monitored as per the Trust guidelines.

Results
The standard applied to 101 of the 152 records that were audited across the four rounds. Table 1 / Figure 1 show the low level of compliance at baseline, the decrease between the first and second audit and the steady increase from the third round onwards, following the intervention of the stamp on the pathology forms.

Fisher’s exact test, which is best for small samples of categorical data, was used to assess the statistical significance of the results. To determine whether there was a significant difference in the cycles prior to and after the use of the prolactin stamp, the first cycle
(pre-intervention) was compared with the third and fourth rounds. Similarly, the second round (pre-stamp) was compared with the third and fourth rounds. Four Fisher’s exact tests were performed. The number of patients who received baseline prolactin blood level testing in the first round was significantly different from the number tested in the third \( (p=0.0069) \) and fourth \( (0.0002) \). Additionally, the number of patients tested for prolactin in the second round significantly differed from those who were tested in the third \( (p<0.00001) \) and fourth \( (p<0.00001) \). There is strong evidence to suggest that first and second rounds are different from the third and fourth. Significantly more patients received prolactin screening in the third and fourth compared with the first and second rounds.

**Discussion**

At the start of the quality improvement project, compliance with the standard was at 18%. Simply raising awareness of the guidelines by e-mailing staff about them, sharing the audit results, and discussing the requirement at the junior doctor induction was insufficient to improve compliance with the standard and indeed disconcertingly the compliance decreased. Despite a careful selection time frame (after the action plans were implemented from stage 1, this period also included the end of the rotation of August-February junior doctors and the start of the new rotation, it was also a period that included induction time for the junior doctors which included the guidelines related to this study), thus the decreased compliance rate could be due to the busy period of an end of rotation and the next set of doctors being new to the site.

About 77% of audited patients met the standard at the time the fourth set of data was collected. While still below the initial standard of 90%, this represented significant improvement from the starting point of 18% and the second measure of 0%. Change in practice following the introduction of prolactin stamps was clear from comparing the results of the four sets of data. Prior to the prolactin stamps, when routine blood tests were done, prolactin was not routinely being included in baseline bloods. After the intervention, this test was being much more regularly included. In addition to immediate improvement in prolactin testing, compliance continued to increase several months after the intervention.

**Audit methodology**

In the latter two cycles more detailed information was collected on the reasons for non-participation of patients who were excluded. QIP rounds three and four also had stricter inclusion criteria in order to yield a fairer result for the purposes of assessing the impact of the prolactin stamp intervention. A non-random classification bias should be considered when examining the results as there were slight differences in inclusion criteria between the first two and the latter two rounds.

**Intervention**

The total cost per ‘Prolactin yes / no’ stamp, including postage, was £8.26. Therefore, the equipment cost for stamps for the six wards including postage was £49.56. The cost per prolactin test was £8.20 at the time of the project and therefore for the 22 patients eligible for the prolactin test during the audit period, the cost would have been £180.40. Overall, therefore, neither the stamp intervention nor the additional prolactin level testing would be cost prohibitive for the organisation to implement in improving the quality of baseline screening in this patient group.

An ideal and sustainable solution would be to have chemical pathology and immunology laboratory’s blood forms incorporate prolactin on the list of test choices. However, this was not possible at the time of the project and is still not possible in some psychiatric units in the UK that rely on a neighbouring acute site to process their blood test requests, but this practice could be rolled out in other localities in a similar way.

**Conclusion**

During the course of this QIP, there was a 59% increase in baseline prolactin testing and 77% of patients received prolactin testing at the time the fourth round of data collection took place. The ‘Prolactin yes/no’ stamps successfully prompted clinicians to order this test. The third round, conducted a week after the stamps came into effect resulted in significant improvement in prolactin testing. The fourth, which started three months after the introduction of the prolactin stamps and ended a month later, suggests the stamp created sustained improvement since compliance had continued to rise during this time period.

Better integrated care pathways may improve the pathology services for mental health patients, including greater recognition that physical illnesses can be diagnosed earlier.\(^8\) In the meantime, we would suggest that a low-tech, low-cost intervention such as the prolactin stamp can continue to improve and sustain better practice in baseline monitoring of our patients being treated with antipsychotics if mental health trusts are unable to negotiate printing of...
adjusted blood request forms from their contracted local acute hospital trust laboratories. Better monitoring of prolactin levels would allow clinicians to catch clinically significant abnormal results, which is particularly important among psychiatric inpatients who tend to under-report symptoms.\(^1\)\(^,\)\(^{10}\) Complying with monitoring and treatment guidelines will result in a considerable and necessary improvement of physical health outcomes for this patient group.\(^1\)

In this QIP we did not look at the prolactin test data itself or the level of any abnormalities in our sample. We would recommend conducting further QIPs to look into and ascertain the patterns of the prolactin results being yielded, the abnormality rates and if there are any abnormalities within the patient population, and what clinic action is being taken and followed up.

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**Declaration of interests**

No conflicts of interest were declared.

**References**


**POEMs**

An oral appliance does not improve sleep in patients with less severe sleep apnea

**Clinical question**

Can an oral appliance decrease snorin, improve quality of life, and decrease daytime sleepiness in patients with mild to moderate obstructive sleep apnea?

**Reference**


**Synopsis**

These Swedish researchers evaluated the effectiveness of an oral appliance in 96 patients with snoring, daytime sleepiness, and mild to moderate obstructive sleep apnea (apnea-hypopnea index < 30). The appliance, worn at night, holds the patient's jaw forward to maintain a patient's airway. The patients were assigned, using concealed allocation, to receive a custom-fitted oral appliance or a placebo appliance that did not affect the jaw placement. The patients were not told of their treatment assignment, though I suspect a quick surf of the Internet would bring up a picture for the curious. Nonetheless, there was no difference in daytime sleepiness (using the Epworth score) between the 2 groups after 4 months of treatment. Similarly, the appliance did not improve measures of sleepiness, sleep resistance, quality of life, or functional outcomes of sleep (all measures of the results of sleep). However, snoring, symptoms of restless legs, and the measure of obstructive sleep apnea were improved. These results, though not part of the study, may be valuable for bed partners.