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Editorial

Flagging fasting plasma glucose specimens: time to routinely label the context in which pathology specimens are recorded

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When filing, searching or analysing clinical data it is often impossible to know whether a sample has been taken after the patient has fasted or not. This is a situation that should not be allowed to continue. Every day clinicians are wasting time opening patients records to look for an indication if the result they are about to 'file' was taken fasted or not. Clinical audit and research into diabetes, cardiovascular disease and assessment of renal function are all much less effective when it is not known whether or not results are based on fasting samples.

This problem is broader than fasting specimens; there is a range of pathology tests better measured under specific conditions. In primary care the tests best carried out fasted are: blood glucose and lipid profiles. Lab Tests Online recommend eight hours fasting before glucose testing and 9–12 hours before serum lipids are measured.[1] Plasma glucose is particularly difficult to interpret because a fasted specimen only needs to be over 7.0 mmol/l to diagnose diabetes; whereas a random sample needs to be over 11.1 mmol/l.[2] The situation is further complicated by glucose tolerance tests, where two readings may arise on the same day. In my research group we adopt the pragmatic step of processing two non-zero value plasma glucose tests as a glucose tolerance test.

Some urine tests are best done in specific ways: for example, midstream urine tests for infection are thought to reduce contamination;[3] and pregnancy tests may be more reliable if done first thing in the morning.[4] Historically, early morning urine (EMU) tests were used for pregnancy testing though as tests have become more sensitive this has become less necessary.[5] Carrying out an 'EMU' for many clinicians was synonymous with doing a pregnancy test.

More recently tests of renal function, specifically creatinine, have joined the list of tests best done under more controlled circumstances. The UK's National Institute of Health and Clinical Excellence (NICE) recommends that when creatinine blood tests are being carried out to test renal function (or more strictly, estimate glomerular filtration rate – eGFR) patients should refrain from eating meat for 12 hours before the specimen is collected (and that it should be analysed within 12 hours).[6] These stipulations have led the Editor's practice to carry out renal function tests as far as possible alongside fasting lipids in the morning – when it is less likely that patients will have had a large protein load and less likely that creatinine specimens will be left unanalysed overnight.

NICE also recommends that people with impaired renal function (chronic kidney disease – CKD) should have a proteinuria test (the albumin–creatinine ratio). If this is slightly raised it is recommended that this is repeated in the early morning. Again common sense dictates that it sensible that this group have all their blood and urine tests together, fasted, obviating the need for repeat testing. However, if it is impossible to tell from the record if it is an early morning specimen it is challenging to audit results.

The correct tagging of specimens and test results in electronic patient record (EPR) systems should be a more important issue for informaticians than it appears to be at present. The status quo is unacceptable and has a negative effect on patient care by reducing our ability to use routinely collected data to monitor the quality of care. Further, if it results in needless repeat tests it wastes everybody's time and precious health resources.

In current quality improvement studies I am involved in, a combined sample of over 900 000 people had a prevalence of Type 2 diabetes of 3.4%. These studies included 27 000 people diagnosed with Type 2 diabetes. We found 1000 people with Type 2 diabetes on no treatment, with only an elevated blood glucose measure to indicate they had diabetes at all. Of this group, 304 people had a plasma glucose of 11.1 mmol/l, confirming they had diabetes (over 11.1 is diagnostic regardless of whether fasted or not). The remaining 623 people, roughly six per practice, had a blood glucose

of at least 7.1 mmol/l but less than 11.1 mmol/l. Unfortunately between 7.1 mmol/l and 11 mmol/l we need to know if the patient has fasted or not to confirm the diagnosis. If this is not flagged in the EPR people may be recalled unnecessarily to confirm or refute the diagnosis of diabetes.

The current situation is frustrating because codes exist to flag these contexts. The Read codes, the terminology used in the UK,[7] include codes to flag fasting plasma glucose results or the results of glucose tolerance tests; however, these are not operationalised within the workflow which returns laboratory test results to EPR systems. In my current quality improvement study we note that around a quarter of the population have had a plasma glucose blood test. However, of these quarter of a million glucose results ($n = 238\,347$) the overwhelming majority were not allocated codes which indicated if they were taken fasted or not. No tag was given to 83.1% ($n = 198\,051$). Only a minority, 14.6% ($n = 34\,829$), were labelled with fasting codes, and 2.3% ($n = 5467$) were coded as random specimens.

A purist might argue that we need to develop labels for all alternatives before we move forward – from fasting blood glucose to day 21 progesterone (a blood test that is performed on the 21st day of the menstrual cycle to see whether ovulation has occurred). However, this editorial proposes that we incorporate just two into clinical workflows: (1) fasting; and (2) 'early morning' for first test of the day. An alternative approach would be to request that NICE insist that whenever guidance is produced which requires specimens to be taken under particular circumstances, the necessary code should be operationalised and added to the laboratory links in such a way that it becomes part of routine clinical workflow. This would allow relevant clinical data to be properly labelled and unnecessary test repeats and diagnostic uncertainty avoided.

Alongside the ambitious National Programme for IT the informatics community needs to highlight and address relatively simple issues which would help ensure that more people with diabetes and other important clinical conditions are correctly diagnosed and managed. The labelling of results needs to be given greater priority, alongside other important issues about diabetes coding and classification discussed later in this issue.

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