Does point-of-care testing in general practice for leucocyte and differential count change use of antimicrobial medicines? A pilot study

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Does point-of-care testing in general practice for leucocyte and differential count change use of antimicrobial medicines? 
A pilot study

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Abstract. Diagnostic uncertainty when considering prescription of antimicrobials (‘antibiotics’) in primary care contributes to the major problem of microbial resistance. We conducted a feasibility evaluation of rapid testing for leucocyte and differential count in two urban general practices, surveying the GPs online and interviewing them. GPs reported that the machines were easy to use, the test results influenced their care and they would adopt the system if costs were off-set. Feasibility, acceptability and perceived benefit justify a randomised trial to test the effect on antibiotic prescribing rates and quality of care, with an economic evaluation to inform the cost-benefit.

Keywords: ambulatory care facilities, delivery of health care, diagnostic services, point-of-care systems, primary health care.

Introduction
Deciding whether to prescribe antibiotics is often difficult, and GPs tend to err on the side of caution, prescribing more antibiotics than guidelines recommend (McCullough et al. 2017). This might contribute to the antibiotic resistance crisis (O’Neill et al. 2015; Australian Government 2018). In support of the urgent need to reduce antibiotic use, there is an increasing focus on general practice, where the greatest volumes of antibiotics are prescribed for human use (Choosing Wisely Australia 2018; NPS MedicineWise 2018).

One problem is that of diagnostic uncertainty in general practice (Del Mar et al. 2017). Several near-patient testing interventions, including C-reactive protein and procalcitonin, have been shown to reduce antibiotic use (Tonkin-Crine et al. 2017), as has total leucocyte and differential count in a paediatric practice (Casey et al. 2003; Casey and Pichichero 2009). GPs report that they would like to have more point-of-care (POC) tests available to them, including leucocyte count (Howick et al. 2014). Australian GPs’ low use of point-of-care tests that might influence decisions about the prescribing of antibiotics may result largely from a lack of support for this through Medicare or other public funding.

Hemocue WBC DIFF machines (www.hemocue.com/en/solutions/hematology/hemocue-wbc-diff-system, accessed 16 September 2020), which provide total leucocyte and differential counts in 5 min from a finger-prick drop of blood, are being used in remote health centres (Spaeth et al. 2015, 2019) and small rural hospitals around Australia without on-site pathology services (Radiometer Pacific, pers. comm.). The accuracy of this machine has been confirmed (Simpson et al. 2009; Kok et al. 2015). We wondered whether this test could be used by urban GPs with a view to similarly support clinical decisions.

As a preliminary to formal testing of these objectives, we decided to evaluate the feasibility, acceptability and perceived utility of this system.

Specifically, we wanted to know whether GPs and practice nurses could adapt the test to their workflow; whether and how the results of the test changed care; and whether the system was seen as valuable enough to use, if costs were not a problem.

The practice innovation

Method
The Australian distributor (Radiometer, Mount Waverley, Vic., Australia) installed four Hemocue WBC DIFF machines in two urban general practices in Adelaide, South Australia, provided all consumables and maintained the machines. Participating GPs and practice nurses were trained in the use of the machines during a 1-h meeting at each practice in March and April 2018, respectively, which was run by Radiometer staff and Dr Oliver Frank. GPs were free to use the machines until September 2018.
to perform total leucocyte and differential counts for any patient that they wished.

We surveyed the GPs in late September 2018 using a Web-based service (www.surveymonkey.com) using eight fixed-response questions and one open-answer question, and interviewed GPs and practice nurses in a group at each practice, audio recording these and transcribing relevant parts of the interviews.

We obtained ethics approval (number H-2018–014) from the University of Adelaide. All participants gave written informed consent.

Results

Participation in the study was agreed by 14 of 29 GPs, two GP registrars and 4 of 10 practice nurses. All 14 GPs completed the online survey and 13 GPs and four practice nurses participated in the group interview. The registrars’ terms ended during the study and they did not provide any feedback.

Approximately 95 tests were performed for patients during the study. This equates to an average of one test per GP per month. The responses to questions from the online survey are shown in Table 1, and representative feedback given at the group meeting interviews are shown in Box 1.

Most of the participating GPs found it easy to learn to perform the tests and reported that the results influenced the care they provided. They reported that the finding of a normal white cell count and absence of neutrophilia was reassuring to them and to patients, and that this influenced them not to prescribe an antibiotic for patients for whom they otherwise might have done so. They estimated that in routine care, they would use one or two tests a day. However, to continue using the test would require compensation for costs and time for testing.

Discussion

Our assumption that GPs and their practices could learn to use the Hemocue WBC DIFF machine was found to be mostly correct. We learned that the initial training was not enough to enable some of the GPs and practice nurses to use the Hemocue WBC DIFF machine successfully.

Our assumption that GPs would actually perform the white cell counts for patients was also partly correct. Although it was not mentioned in the survey or in the group interviews, we gathered via informal discussions that in the rush of consulting, the GPs often forgot that they had the Hemocue WBC DIFF machine in their practice and they could have used it. We believe that this is something that affects the uptake of many or most new procedures and systems in general practice (Orchard et al. 2019). In the cluster randomised controlled trial that we propose, more intensive initial support and follow up of participants, with continuing discussion at practice meetings, will help to make POC testing of total leucocyte and differential counts a part of routine practice in intervention practices.

We learned that the 10 min or more required for the whole testing process, including collecting the specimen, taking it to the machine, running the test, reading the result and entering it into the patient’s record, could not be accommodated within current practice workflows.

Table 1. Responses from GPs to the online survey

<table>
<thead>
<tr>
<th>Question</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Did you learn to use the Hemocue WBC DIFF machine?</td>
<td>13</td>
<td>1</td>
</tr>
<tr>
<td>How easy or difficult was it to use the Hemocue WBC DIFF machine?</td>
<td>Very easy</td>
<td>Easy</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>10</td>
</tr>
<tr>
<td>Did you use the Hemocue WBC DIFF machine for any of your patients?</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>3</td>
</tr>
<tr>
<td>Did using the Hemocue WBC DIFF machine change your care of any of those patients?</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>Who collected most of the specimens and ran the WBC DIFF tests for your patients who were tested?</td>
<td>I prescribed an antibiotic for one or more patients when I might otherwise not have done so</td>
<td>I decided not to prescribe an antibiotic for one or more patients when I had been considering it (either because the patient was asking for a prescription or because I had thought that an antibiotic might be indicated)</td>
</tr>
<tr>
<td></td>
<td>9</td>
<td>1</td>
</tr>
<tr>
<td>Comments from representative feedback</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>How did the results of the WBC DIFF test influence your care of different patients? (Please choose as many as apply)</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>2</td>
</tr>
</tbody>
</table>
These results suggest GPs would find the test useful and acceptable if the costs of the machine, consumables and time to perform the tests were funded. Therefore, we suggest that a randomised trial, with an economic evaluation, should be performed to quantify benefits (decrease in antibiotic use and costs) of the tests were funded. Therefore, we suggest that a machine would have helped them to use it.

Conflicts of interest

The authors declare no conflicts of interest.

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