



# A prospective study of the effectiveness of electronic patient records in rapid-cycle assessment of treatment and partner notification outcomes for patients with genital chlamydia and gonorrhoea infection

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## ABSTRACT

**Objective** To assess the effectiveness of electronic patient records (EPRs) in facilitating multiple, rapid measurements of treatment and partner notification (PN) outcomes for chlamydia and gonorrhoea.

**Methods** In two sexual health clinics, the proportion of patients with chlamydia and gonorrhoea who had been treated within 4 weeks of diagnosis was measured, and also the proportion where at least one of their partners had been treated. These outcomes were measured monthly for 6 months, and changes in recording practice were instituted when necessary.

**Results** It took 8 h to capture and analyse the data for 89 patients in month 1. The health advisers subsequently entered data into searchable fields to facilitate better data capture. As a result, by month 6 it took only 1.5 h to measure these outcomes using an electronic search. It had previously taken 2 days to perform the same analysis using paper records. In month 1, successful treatment was recorded in 26/27 (96%) patients with gonorrhoea and 57/61 (93%) with chlamydia, and there was successful PN for gonorrhoea and chlamydia patients in 19/27 (70%) and 39/61 (64%). By month 6, the recorded outcomes were 30/31 (97%) and 81/86 (94%), respectively, for successful treatment and 28/31 (90%) and 74/86 (86%) for successful PN, respectively.

**Conclusions** Frequent rapid clinical outcome monitoring is easily attained using EPRs as long as the data are entered into searchable fields. Treatment and PN success for chlamydia and gonorrhoea with this method are well above national targets, which may be attributable to both the use of EPRs and better data capture.

## INTRODUCTION

Electronic patient records (EPRs) have many potential advantages, one being that clinical data can be recorded in a consistent way and therefore would be amenable to capture through an electronic search.<sup>1–5</sup> This sexual health service has used EPR since 2007,<sup>6</sup> since when stepwise changes have occurred in the system to make clinical data recording and capture progressively easier. We have recently shown that inherent system efficiencies with EPRs lead to significant improvement in the time taken to recall and treat patients with untreated chlamydia.<sup>7</sup> In late 2009, the hospital

managers requested that all clinical services provided monthly clinical outcome measures that were relevant to the service. For sexual health, we chose as our outcome measures the successful treatment of chlamydia and gonorrhoea and partner notification (PN) outcomes for chlamydia. We subsequently also measured the PN outcomes for gonorrhoea. In this paper, we show how we instituted measurement of these outcomes and subsequently changed the way data were recorded in EPRs such that outcomes could be frequently and rapidly measured in a way that is well beyond the capacity of paper-based records.

## METHODS

### Setting

The study was performed in two hospital-based sexual health clinics serving a socially deprived and ethnically diverse area of north London. The clinics see most patients as self-referred 'walk-ins' and have approximately 24 000 attendances for 18 000 individual patients per year. The service uses EPRs based on the Blithe 'Lilie' system (Blithe Computer Systems Ltd, Burton-on-Trent, UK), and the clinical templates used are of our own design.

### Methods of evaluation

#### Patient recall and partner notification

All patients with positive chlamydia and gonorrhoea tests were contacted by telephone, text or letter by a sexual health adviser (a nurse or other healthcare graduate trained in sexual health). Once contact was made, those who had already been treated at their initial visit were asked to confirm how many partners they had who were at risk and whether their partners had already attended for treatment as a result of PN. Untreated patients were asked to return for treatment and PN. Two weeks after treatment, all patients were contacted again by phone and asked to confirm treatment adherence, questioned on any new sexual risk, and again asked about number of partners informed and treated. Additional evidence of successful PN was recorded from records of identified partners attending this service or other services after the return of a contact slip. Multiple attempts were made to contact patients who failed to attend for treatment and for those for whom PN information/resolution was incomplete.

### Measuring the clinical outcomes

In September 2009, we identified all patients who had been diagnosed with gonorrhoea and chlamydia in that month. For each patient with chlamydia and gonorrhoea, we identified the proportion that had been successfully treated by 4 weeks after the end of the period; so, for September, this was the number treated by the beginning of November. We also measured the number of patients with recorded evidence of treatment of at least one partner. Initially, to achieve this meant a manual inspection of all EPR consultations relevant to the time of diagnosis. Having identified problems in the way data were entered, we instituted changes in the way the health adviser team recorded data when dealing with infected patients. This involved recording outcomes in specific searchable fields. Treatment successfully given (0='no', 1='yes'), number of partners at risk and number of partners known to have been treated were recorded in three separate numeric input fields in each patient's EPR consultation template. The three outcomes were measured again for October and November (in early December and early January, respectively). Once it was clear that data entry was relatively complete and appropriate, an EPR database search was written using Crystal Reports (Crystal Reports XI; Business Objects Software Ltd, Vancouver, Canada) for these outcomes and a search performed for the period December 2009 to February 2010 in late March 2010.

### RESULTS

The clinical and PN outcomes for each of the 6 months are given in table 1. The processes and times involved in measuring the outcomes are seen in figure 1. In 2007 when we used paper case notes, based on the experience of similar past audits, we estimate that it used to take at least 16 person-hours work to do this type of clinical outcome and PN assessment. In September 2009, using our EPR system, it took 8 h to measure these outcomes. For that month, each of the 89 individual EPR consultations had to be inspected, as data on treatment outcomes and PN outcomes especially were not being recorded consistently in the same way in each case note. Outcomes were often being recorded as free text, or sometimes in new consultation templates, rather than as numeric figures in the designated outcomes recording fields. This made identification of relevant data difficult. Following this, after discussion and retraining, the health advisers subsequently uniformly recorded the data in the searchable outcome fields. A repeat search was performed for October and November 2009, again looking at individual EPR consultations. The time required to carry out the search for these 2 months fell to 4 h for each month's data, as the data were more easily identified. Once we were satisfied that data were being recorded consistently, a search was written using Crystal Reports to extract the data from the EPR

consultations. Case notes lacking any data were inspected to verify why data were missing and to see if patients with a lack of treatment or PN data were being followed up appropriately. This work took 1.5 h for each month's data.

The staff involved in these searches have also significantly changed over time. In 2007, clerical staff were significantly involved in the process, searching for the paper case notes before the data could be extracted and analysed by health advisers and/or doctors (figure 1). With the use of EPRs, the data extraction is now performed by the data manager or other person skilled in IT before the data are verified and analysed by health advisers and/or doctors as before.

### DISCUSSION

#### Summary

This study demonstrates that, since the introduction of EPRs, the time taken to perform accurate and repeatable clinical outcome and PN verification has fallen by 90%. Data extraction and analysis of a month's worth of clinical activity for the treatment and PN of 80–100 patients with gonorrhoea and chlamydia used to take the equivalent of 2 days when paper notes were used. It can now be done in 1.5 h using EPRs. This means that such searches can be repeated regularly to identify any patient who may have been managed suboptimally and to ensure that high standards are maintained in clinical outcome and PN. The fact that staff are aware of this continuous scrutiny serves to drive up standards of recording.

#### Interpretation of the results

Initially, we found that we were not using the system to the maximum efficiency, as data were not being recorded consistently in the searchable fields. Once this was rectified, searches were quick and simple and the rate of finding complete data is now very high. We have also found that by recording the data in a consistent way, the measured outcomes have improved. The rate of successful PN, as defined by verification of treatment of at least one partner per patient, rose by 22% (from 64% to 86%) for patients with chlamydia and by 20% (from 70% to 90%) for patients with gonorrhoea over the 6 months study period. This may reflect better performance by the health advisers or may be due to better data recording. UK national guidelines give a target of treating at least one partner in 60% of patients with chlamydia within 4 weeks and 40% if the clinic (such as ours) is in a large city.<sup>8</sup> We are thus greatly exceeding these national PN targets. It is worth noting that, in some cases, the verification was based on a verbal report from the index case and not on a verified attendance of the partner. UK national guidelines are not clear on which method of PN the target is based,<sup>8</sup> although the Society of Sexual Health Advisers suggests that verification of actual attendance should be used.<sup>9</sup>

**Table 1** Clinical and partner notification outcomes by month

| Outcome   | Sept 09     | Oct 09       | Nov 09       | Dec 09      | Jan 10       | Feb 10      |
|---|-------------|--------------|--------------|-------------|--------------|-------------|
| Number (%) of patients with gonorrhoea successfully treated within 4 weeks                                | 26/27 (96%) | 17/17 (100%) | 14/14 (100%) | 26/27 (96%) | 16/16 (100%) | 30/31 (97%) |
| Number (%) of patients with gonorrhoea with evidence that at least one partner was treated within 4 weeks | 19/27 (70%) | 12/17 (71%)  | 9/14 (64%)   | 22/27 (81%) | 13/16 (81%)  | 28/31 (90%) |
| Number (%) of patients with chlamydia successfully treated within 4 weeks                                 | 57/61 (93%) | 49/53 (92%)  | 88/93 (95%)  | 85/87 (98%) | 83/86 (97%)  | 81/86 (94%) |
| Number (%) of patients with chlamydia with evidence that at least one partner was treated within 4 weeks  | 39/61 (64%) | 36/53 (68%)  | 79/93 (85%)  | 69/87 (79%) | 74/86 (86%)  | 74/86 (86%) |

**Figure 1** Processes for measuring clinical outcomes and time taken to extract and analyse 1 month's data on 90 patients. EPR, electronic patient record.

| Paper Case Notes  | EPR : Manual Inspection of Records   | EPR: Electronic Data Extraction  |
|---|--|--|
| 1. Notes found by clerical staff<br>↓<br>( 4 hours ).                               | 1. Notes immediately available<br>↓<br>electronically ( 0 hours )                  | 1. Electronic data extract<br>↓<br>( 0.3 hours )                               |
| 2. Notes inspected individually<br>and data extracted manually<br>↓<br>( 10 hours ) | 2. Notes inspected individually<br>and data extracted manually<br>↓<br>( 6 hours ) | 2. Small number of EPR files<br>inspected and data verified<br>↓<br>( 1 hour ) |
| 3. Data entered onto a<br>spreadsheet manually and<br>analysed ( 2 hours )          | 3. Data entered onto a<br>spreadsheet manually<br>and analysed ( 2 hours )         | 3. Data is already on a<br>spreadsheet and is analysed<br>( 0.2 hours )        |
| Total time: 16 hours  | Total time: 8 hours  | Total time: 1.5 hours  |

UK national outcome standards suggested that 70% of patients (50% in London) should be treated for chlamydia or gonorrhoea within 4 weeks of diagnosis.<sup>8</sup> National chlamydia guidelines in the UK and USA have not set time-to-treat standards,<sup>10 11</sup> although the English National Chlamydia Screening Programme suggests that 50% and 80% of patients should be treated within 14 and 30 days, respectively.<sup>12</sup> The Clinical Effectiveness Group UK gonorrhoea guidelines also give a target of 70% of patients (50% in London) being treated within 4 weeks.<sup>13</sup> Our treatment outcome data exceed these national targets in that 96–100% of patients with gonorrhoea and 93–97% of patients with chlamydia are being treated within an average of 4 weeks after attendance. This has been previously shown to be due to the efficiencies that EPRs bring.<sup>7</sup>

The reasons why this system is so efficient for clinical outcome measurement are clear. First, EPR case notes can be instantly, multiply and distantly accessed rather than staff having to spend time looking for paper case notes. This time is reinvested in clinically important activity. Second, clinical information can be recorded on the EPR clinical templates in such a way that it is amenable to electronic search.<sup>5</sup> The latter is not always intuitive, as people tend to want to record information in free text, as it replicates the narrative of a consultation and the usual method of paper case note recording. It is relatively difficult to extract data through electronic searches from free-text fields.<sup>3 4</sup> It is relatively easy to summarise outcomes in a numerical/coded searchable form once the important outcomes have been decided. A balance needs to be struck between having searchable data fields and free text input in EPRs to make such clinical systems as user-friendly as possible.

Future research needs to look at rationalising how EPR data are collected. As several different EPR systems develop in sexual health, there needs to be a consensus on which are the important data that need to be recorded in searchable fields to allow ready capture of such through electronic searches. In an ideal world, each clinic would record data in such a way that the electronic data searches would work on multiple systems and at different clinics. There is a real danger that each clinic and each software developer will develop their EPRs in divergent directions meaning that routine clinical outcome searches will not be transferrable.

**Relation to other evidence**

As shown in this and a previous report,<sup>7</sup> the efficiencies inherent in the use of EPRs lead to more effective patient recall, treatment and PN. Our service now consistently exceeds national standards,<sup>9</sup> and we believe it does so by a process that has capacity to improve further.

**Key messages**

- ▶ Clinical outcome and partner notification measures can be rapidly and repeatedly measured using electronic patient records (EPRs).
- ▶ Data need to be entered into searchable fields within the EPRs to allow subsequent data extraction.
- ▶ EPRs improve the efficiency of data recording such that the effectiveness of the service's clinical outcomes are accurately reported.
- ▶ EPRs allow more effective patient recall and assessment of PN success leading to better clinical outcomes.

**Strengths and limitations**

The strength of this study is that it compares patient data from the same cohort over contiguous time periods, in a normal clinical situation and is therefore a reflection of our standard clinical practice. It is also the first paper to demonstrate how EPRs can improve the efficiency of measuring clinical and PN outcomes within the setting of a sexual health clinic. A potential weakness is that these improvements in outcome and data recording could be due to the health adviser team being aware of the repeat assessments. Without continuing assessments, there is a danger of standards falling.

**Conclusions**

There is a need for new national standards to be set for the time taken to treat infected patients and the proportion with successful PN. EPRs are superior to paper-based case records in enabling the efficient, frequent and repetitive assessment of clinical outcomes for sexually transmitted infections, such as chlamydia and gonorrhoea, as well as having several other inherent advantages.<sup>6 7</sup>

Appropriate use of technology greatly improves our ability to record and collect data. It also enables us to treat patients and their partners rapidly. We should therefore strive to use such technologies to their maximum efficiency for the good of our patients and the betterment of public health. Clinics still running paper-based case records should strongly consider switching to EPRs.

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**Contributors** GB and JM planned the study and analysed the data. LC, LR and SM performed the data collection and suggested changes in the methodology of data

collection. GB wrote the first draft of the paper, and JM, LC, LR and SM contributed to rewriting subsequent drafts.

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