Research Brief

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North Carolina Preparedness and Emergency Response Research Center

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Electronic laboratory reporting improves surveillance processing at local and state health departments

Background

All states now use electronic laboratory reporting (ELR) for reporting some communicable disease cases. Two factors make it likely that the proportion of case reports transmitted by ELR will increase: (1) the inclusion of ELR in legislation providing incentives for the meaningful use of electronic health data and (2) the focus on ELR by the Centers for Disease Control and Prevention (CDC). ELR increases both the speed of initial notification to public health and the number of cases reported. However, the increased number of cases has to be managed by limited public health staff. In addition, ELR is subject to problems specific to electronic transmission (such as unexpected changes to reporting resulting from programming changes at laboratories) and increases the number of duplicate case reports. Therefore, the expected increase in ELR may be difficult to manage, unless ELR also makes case report processing more efficient.

We evaluated the effect of ELR on case report processing using data from North Carolina's reportable disease surveillance system. The North Carolina statewide electronic reportable disease surveillance system, North Carolina Electronic Disease Surveillance System (NC EDSS), was implemented in 2007-8, and ELR was implemented in 2007 by the North Carolina State Laboratory of Public Health and the Laboratory Corporation of America. Following the implementation of NC EDSS and ELR, the number of case reports received increased and a backlog of unprocessed cases developed. Between 2010 and 2012, North Carolina Division of Public Health (NC DPH) staff made a concerted effort to enter the backlog of reportable disease cases accumulated at local health departments (LHDs) and at the state. We compared case report processing accuracy and timeliness for reportable disease cases delivered by ELR and non-ELR in 2010 and 2012.

In this study we found that electronic laboratory reporting decreases:

- **the processing time required for communicable disease case reports**
- **the proportion of cases that need to be returned to local health departments for changes in the case report**

Methods

Data were obtained from the NC EDSS system on all closed cases of reportable communicable diseases captured in the system; HIV and syphilis were not entered into NC EDSS during the study period. A data set consisting of cases reported from May to July 2010 was created in January 2011 and a data set consisting of cases reported from January to March 2012 was created in April 2012. These data sets contained records with differing follow-up intervals (6 - 9 months for 2010 and 15 days - 3.5 months for 2012). To compare timeliness and accuracy between 2010 and 2012, follow-up records for the 2010 data set were limited to 15 days – 3.5 months (2010 comparison data set).

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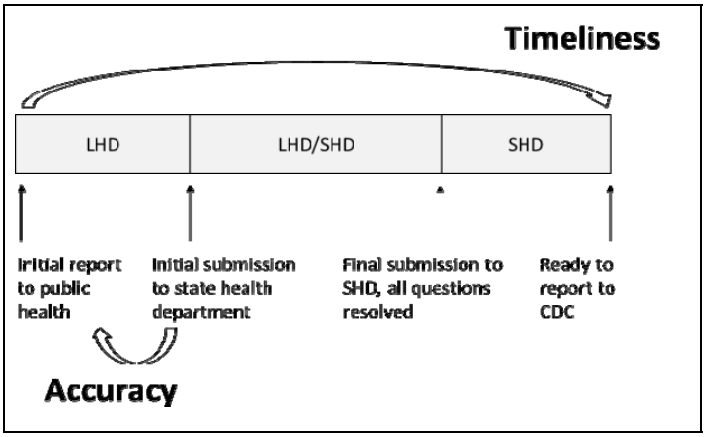
Stages of case processing were established as: 1) initial case report to LHD to initial case submission to state health department, 2) for cases returned to the LHD for additional information, initial case submission to state health department to final submission to state health department, and 3) final case submission to state health department to report to CDC. Overall timeliness was defined as time from initial case report at LHD to report to CDC. These stages are depicted in *Figure 1*.

Measures of accuracy and timeliness were constructed for comparison of ELR and non-ELR cases. Accuracy was defined as the percent of cases returned to the LHD for corrections or additional information after first submission of case to state health department. Accuracy numbers are presented for the full 2010 data set as well as the comparison data set, because cases returned to the LHD are over-represented in the subset of cases removed to create the comparison data set. Timeliness was defined as the median days per case required for each processing stage.

Figure 1: Case report processing timeline and measures



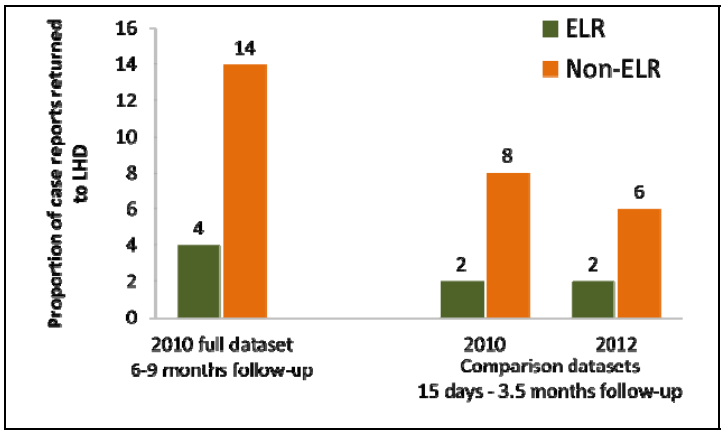
Results

The full 2010 data set consisted of 15,979 cases with complete data (cases closed within a maximum 9 months of case processing time). The comparison data sets from 2010 and 2012 contained 11,560 and 16,095 complete cases, respectively. The comparison data set for 2010 contained 72% of the cases in the original data set; therefore, 72% of the cases in the original data set were closed with less than or equal to 3.5 months of case processing. In both the limited 2010 and 2012 data sets 40% of cases were created by ELR.

Accuracy

Cases reported by ELR were less likely to be returned to the LHD for additional information than were cases reported by non-ELR means. For the full 2010 dataset, 14% of ELR cases were returned to the LHD, while 23% of non-ELR cases were returned (P=.04; *Figure 2*). For the 2010 and 2012 comparison data sets, with limited follow-up time, the proportion of cases returned is much lower. However, the ELR vs. non-ELR comparison remained the same: ELR cases were less likely to be returned to the LHD in both data sets (2% ELR cases returned compared to 8% non-ELR cases returned in 2010, P=<0.001; 2% compared to 6% in 2012, P=<0.001).

Figure 2: Case report processing accuracy
NC 2010 and 2012 full and comparison datasets

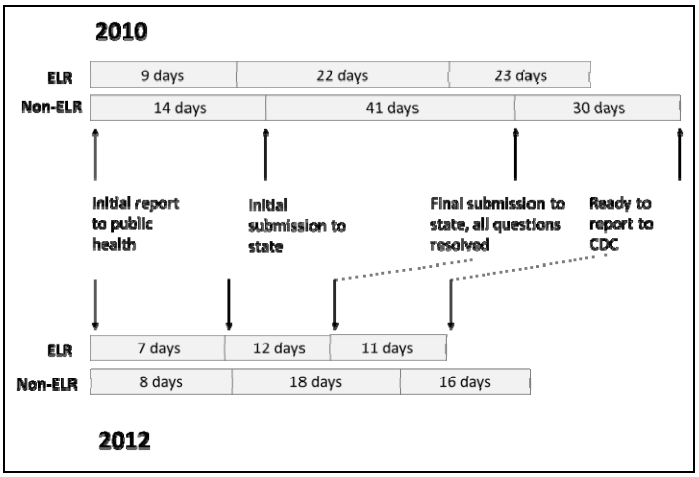


The research was carried out by the North Carolina Preparedness and Emergency Response Research Center (NCPERRC) at the University of North Carolina at Chapel Hill's Gillings School of Global Public Health and was supported by the Centers for Disease Control and Prevention (CDC) Grant 1Po1TP000296. The contents are solely the responsibility of the authors and do not necessarily represent the official views of CDC. Additional information can be found at **http://cphp.sph.unc.edu/ncperrc**.

Timeliness

The median total case processing time for ELR cases in the comparison data sets was less than for non-ELR cases. In 2010, the median days of case processing time for ELR cases was 43 days while non-ELR cases required 52 days (P=<0.001). Similarly, the case processing time required for each separate stage for ELR cases was less than for non-ELR cases (Figure 3). Following the reduction in case backlog, cases were processed more quickly in 2012 than in 2010. The median time required for all processing was 43 days for the 2010 comparison data set and 22 days for 2012 (P=<0.0001). In 2012 as in 2010, the data suggests that ELR cases were processed more quickly than non-ELR cases (median 20 and 25 days, respectively) but not all differences were significant (Figure 3).

Figure 3: Case report processing timeliness (median days)
North Carolina 2010 and 2012 comparison datasets



Differences by Disease

Case processing accuracy assessed using the full 2010 data set was higher for ELR cases than for non-ELR cases for all disease categories. A smaller proportion of sexually transmitted disease (STD), vaccine-preventable disease (VPD) and other communicable disease (CD) cases reported by ELR were returned to the LHD (4% for STD, 27% for VPD, and 8% of other CD) than non-ELR cases (13% for STD, 63% for VPD, and 39% of other CD; all P=<0.05).

Case processing timeliness differed by disease category, with much of the advantage of ELR processing being found for sexually transmitted disease (STD) cases. For STD cases, ELR cases required a median total processing time of 53 days of processing, compared to 77 days for non-ELR. For VPD cases, median total processing times were 103 and 104 days respectively, while for other CD cases, 66 and 62 days of processing time were required (P=<0.05, >0.05, and <0.05 respectively).

Limitations

As described, we artificially limited case follow-up to allow comparison. It is important to be aware that true median times for case processing are longer than shown here. Additionally, the median days shown for case processing do not represent actual working time; rather, they include time when the case was sitting in the system, and therefore shouldn't be used to describe the time public health staff spent investigating cases or entering data.

Discussion and Conclusions

Implementation of ELR improves timeliness and accuracy of case processing. Cases reported by ELR were processed more quickly than non-ELR cases in 2010 and 2012. Additionally, by 2012, despite the increase in cases seen following ELR implementation, overall case timeliness had improved significantly. Although increasing use of ELR may increase case load and alter case processing patterns, ELR makes case processing more efficient (i.e. more accurate and timely) and is therefore likely to improve overall surveillance efficiency.

Although improvements in ELR timeliness and accuracy have been demonstrated, further improvement to ELR can be achieved. For some diseases, the lab data flow is complex; for example, some chronic diseases result in multiple reports, and some case definitions require results of multiple tests. Allowing the surveillance system to help manage this data flow by appropriately prioritizing or de-prioritizing tests may be valuable. Programming the system to create events only when a public health investigation is merited could more efficiently structure investigation time and would increase the timeliness of reporting of true cases of this type.

Authors & Acknowledgements

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Notes:
1. The Federal HITECH (Health Information Technology for Economic and Clinical Health) Act, part of the American Recovery and Reinvestment Act (2009)

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