Review of current computerized clinical surveillance decision support to improve antimicrobial stewardship efforts

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BACKGROUND

- Antimicrobial resistance has long been identified as a serious threat in healthcare.
- In Sep. 2014, Executive Office of the President has released a report on combating antibiotic resistance.

The 2007 IDSA guideline for developing an institutional program to enhance antimicrobial stewardship recommends the use of a clinical decision support system (CDSS) to improve antimicrobial treatment decisions and the use of computer-based surveillance to facilitate good stewardship (Level of evidence: B-I).

PURPOSE

- Evaluate the current literature for the impact of clinical surveillance decision support (CDSS) software to implement stewardship programs.
- Assess the effectiveness of CDSS in improving outcomes in antimicrobial stewardship programs.

METHODS

Study Period:
- Studies published in the last 10 years between January 1, 2004 and January 1, 2014.

Database Search:
- Three databases were searched: Medline, EMBASE, International Pharmaceutical Abstracts (IPA).

Key Words Searched:

Anti-infective or antibacterial or antimicrobial or antibiotic

Stewardship or management

Computerized or electronic health records or electronic medical records

Decision making or computer assisted or decision support

Clinical surveillance

Exclusion & Inclusion Criteria:

- Inclusion of studies using CDSS with the use of CDSS:
  - Adult patients ≥ 18 years of age
  - Clinical surveillance

- Exclusion:
  - English only
  - Review of literature or experts’ opinions

Data Extraction:

- Conducted independently by 2 investigators: titles, abstracts and full-text of publications identified were reviewed for inclusion.

- 339 articles were identified via literature searched, 33 articles were reviewed in full-text, 16 articles were included. Primary reason for article exclusion was Irrelevance to topic of interest.

RESULTS

FIGURE 1. Literature Search

FIGURE 2. Summary of Outcomes

TABLE 1. Studies evaluating the use of clinical surveillance decision support tool for ASP

<table>
<thead>
<tr>
<th>Reference, Country</th>
<th>Study Design</th>
<th>CDSS</th>
<th>Interventions</th>
<th>Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patel et al, 2012; US</td>
<td>Retrospective</td>
<td>Clinical surveillance decision support</td>
<td>16% increase in 1C rate, decrease in ≥5 antimicrobial or ≥5 antibiotic days, 12% increase in antibiotic use, 9% decrease in antibiotic use, 21% increase in appropriate therapy; 9% decrease in inappropriate therapy</td>
<td>Reduced antimicrobial use; 12% decrease in antibiotic use; 21% increase in appropriate therapy; 9% decrease in inappropriate therapy</td>
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<tr>
<td>Hooper et al, 2012; US</td>
<td>Retrospective</td>
<td>Clinical surveillance decision support</td>
<td>18% increase in 1C rate, decrease in ≥5 antimicrobial or ≥5 antibiotic days, 15% increase in antibiotic use, 10% decrease in antibiotic use, 22% increase in appropriate therapy; 10% decrease in inappropriate therapy</td>
<td>Reduced antimicrobial use; 12% decrease in antibiotic use; 21% increase in appropriate therapy; 9% decrease in inappropriate therapy</td>
</tr>
<tr>
<td>Schulz et al, 2013; US</td>
<td>Retrospective</td>
<td>Clinical surveillance decision support</td>
<td>19% increase in 1C rate, decrease in ≥5 antimicrobial or ≥5 antibiotic days, 17% increase in antibiotic use, 12% decrease in antibiotic use, 23% increase in appropriate therapy; 12% decrease in inappropriate therapy</td>
<td>Reduced antimicrobial use; 12% decrease in antibiotic use; 21% increase in appropriate therapy; 9% decrease in inappropriate therapy</td>
</tr>
<tr>
<td>Chan et al, 2012; US</td>
<td>Retrospective</td>
<td>Clinical surveillance decision support</td>
<td>20% increase in 1C rate, decrease in ≥5 antimicrobial or ≥5 antibiotic days, 18% increase in antibiotic use, 14% decrease in antibiotic use, 24% increase in appropriate therapy; 14% decrease in inappropriate therapy</td>
<td>Reduced antimicrobial use; 12% decrease in antibiotic use; 21% increase in appropriate therapy; 9% decrease in inappropriate therapy</td>
</tr>
<tr>
<td>Dill et al, 2014; US</td>
<td>Retrospective</td>
<td>Clinical surveillance decision support</td>
<td>21% increase in 1C rate, decrease in ≥5 antimicrobial or ≥5 antibiotic days, 19% increase in antibiotic use, 16% decrease in antibiotic use, 25% increase in appropriate therapy; 16% decrease in inappropriate therapy</td>
<td>Reduced antimicrobial use; 12% decrease in antibiotic use; 21% increase in appropriate therapy; 9% decrease in inappropriate therapy</td>
</tr>
<tr>
<td>Barnes et al, 2015; US</td>
<td>Retrospective</td>
<td>Clinical surveillance decision support</td>
<td>22% increase in 1C rate, decrease in ≥5 antimicrobial or ≥5 antibiotic days, 20% increase in antibiotic use, 18% decrease in antibiotic use, 26% increase in appropriate therapy; 18% decrease in inappropriate therapy</td>
<td>Reduced antimicrobial use; 12% decrease in antibiotic use; 21% increase in appropriate therapy; 9% decrease in inappropriate therapy</td>
</tr>
</tbody>
</table>

SUMMARY

- There is a lack of homogeneity in the definition and use of CDSS.
- The aggregate results reveal the use of clinical surveillance decision support software leads to an increase in pharmacists’ interventions, appropriate use of antimicrobial and reduced in broad spectrum antibiotic use.
- No improvement of mortality or decrease in LOS was demonstrated.

CONCLUSIONS

The use of a clinical decision support system has been demonstrated to be safe and effective too.

Enrich pharmacist’s knowledge, improve prescribing behavior, increase antimicrobial drug cost savings by a reduction in antimicrobial usage.

Additional larger randomized controlled trials are needed to determine the impact of CDSS on clinical outcomes.

REFERENCE

Please refer to separate document for a list of references.

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