INTRODUCTION

• In 2011, it was estimated that about 2.2 million units of platelets were transfused in the US.a
• An FDA guidance has highlighted the need to reduce the risk of bacterial contamination of platelet components (PC) via pathogen reduction (PR) or rapid secondary bacterial testing (RT).
• Due to the expense of platelet components and transfusion, the variety of PC that are available, and emerging technologies, models that capture platelet-associated costs are needed to understand the hospital budget impact of PC choice and usage.

OBJECTIVE

• The objective of this project was to create an interactive Excel-based model to analyze the budget impact and shelf life implications of using different PC types from the US hospital transfusion service perspective.

MODEL DEVELOPMENT

Process maps capturing aspects of platelet management from acquisition through transfusion and adverse events were drafted.

- Aspects considered include:
  - Acquisition (purchase and/or self-collection)
  - Storage
  - Secondary bacterial testing (Platelet PGD Test) or pathogen reduction
  - Dispensing for transfusion
  - Transfusion
  - Wastage due to mishandling
  - Bacterial adverse events (sepsis)
- A survey was fielded to 27 US hospital transfusion service directors to understand their platelet management processes and usage patterns.
- Two surveys were performed to observe processes from the perspectives of both a hospital that purchases 100% of its PC and one that self-collects 100% of its PC.
- An Excel model framework was created following refinement of these process maps based on survey and site visits.
- Model framework was populated with base-case costs and probabilities identified through both literature search and survey results.
- Model was refined after review by a panel of seven transfusion medicine physicians.
- An adaptive user interface was programmed on top of the model framework.

METHODS

• Base case annual costs, outpatient reimbursements, and shelf life results are presented in Table 1.
• In the 100% PR-PC scenario, wastage due to expiration is less than that in the 100% C-PC scenario because, although both PR-PC units are more costly, they also have longer shelf-lives. Conversely, wastage due to mishandling is more costly in the 100% PR-PC scenario than in the 100% C-PC scenario due to the greater cost of PR-PC units.
• For all PC scenarios, the costs of dispensing and transfusion are the same.
• Outpatient reimbursement in the 100% PR-PC scenario is greater than that in the 100% C-PC scenario because CMS reimbursements for PR-PC units are greater than most other PC types.

RESULTS

Table 1. Annual Costs, Annual Outpatient Reimbursements, and Mean Per-Unit Shelf-Life

<table>
<thead>
<tr>
<th>Component</th>
<th>100% C-PC</th>
<th>100% PR-PC</th>
<th>75% C-PC / 25% PR-PC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acquisition</td>
<td>$4,717,700</td>
<td>$5,302,500</td>
<td>$8,164,534</td>
</tr>
<tr>
<td>Secondary bacterial testing</td>
<td>$118,534</td>
<td>$1,358,534</td>
<td>$1,604,534</td>
</tr>
<tr>
<td>Wastage due to mishandling</td>
<td>$124,241</td>
<td>$1,496,435</td>
<td>$1,604,534</td>
</tr>
<tr>
<td>Dispensing and transfusion</td>
<td>$57,583</td>
<td>$62,245</td>
<td>$58,749</td>
</tr>
<tr>
<td>Sepsis</td>
<td>$6,419</td>
<td>$6,314</td>
<td>$6,314</td>
</tr>
<tr>
<td>Total hospital cost</td>
<td>$5,831,266</td>
<td>$6,520,963</td>
<td>$6,295,190</td>
</tr>
<tr>
<td>Outpatient reimbursement</td>
<td>$982,703</td>
<td>$1,058,108</td>
<td>$985,056</td>
</tr>
<tr>
<td>Maximum usable shelf-life (hours)</td>
<td>48.0</td>
<td>63.2</td>
<td>51.8</td>
</tr>
</tbody>
</table>

- Values in this table may differ from those in the submitted abstract because the abstract was based on an earlier version of the model, whereas these results are derived from the final model.

LIMITATIONS

• Pathogen reduction benefits not captured by the model include mitigation of transmission-transported graft vs. host disease due to the inactivation of T-cells, and reduction in transfusion transmitted infectious risk from viruses and protozoa such as emerging pathogens, which may impact cost/benefit analyses.
• Not all hospital survey respondents were tracking data for all questions on the survey, resulting in a small sample size; therefore, some model assumptions were based on published, peer reviewed literature or expert opinion.
• Durable equipment costs are excluded.
• The model assumes “applies to” — that is, assuming infrastructure is in place, the model looks at how the costs for C-PC with and without RT vs PR-PC compare.
• Startup costs (e.g., cost of equipment and training) of onboarding either secondary bacterial testing technology or pathogen-reduction technology at a hospital are not included in the model.

CONCLUSION

• The model predicts a modest (1.2X) increase in net costs for PR-PC compared to C-PC depending on the degree of PR uptake; this takes into account cost offsets such as elimination of bacterial detection and irradiation, decreased waste due to increased shelf-life, and outpatient reimbursement. o This represents a small percentage increase associated with using PR-PC when compared to the overall annual blood budget.
• The effective PC shelf-life is potentially increased with PR due to elimination of bacterial detection, and is dependent on nucleic acid testing turnaround time.
• This model can serve as an important tool for hospitals considering PR adoption.

REFERENCES


FUNDING DISCLOSURE

This project is funded by a research grant from Canas Corporation to Rutgers University and Thomas Jefferson University.