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Stochastic programming models for blood supply chain inventory management (topic presentation)

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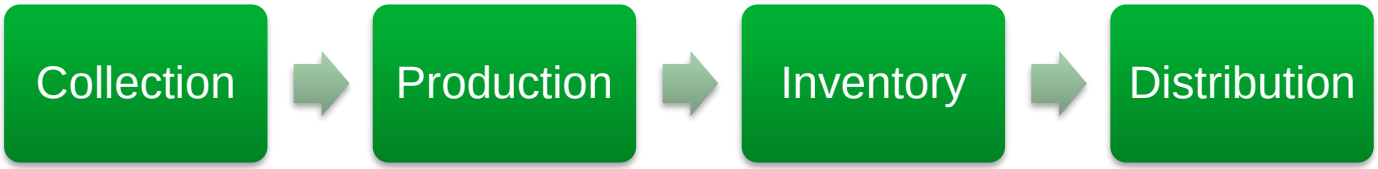
Background (1/3)

- The blood supply chain (BSC) consists of four stages

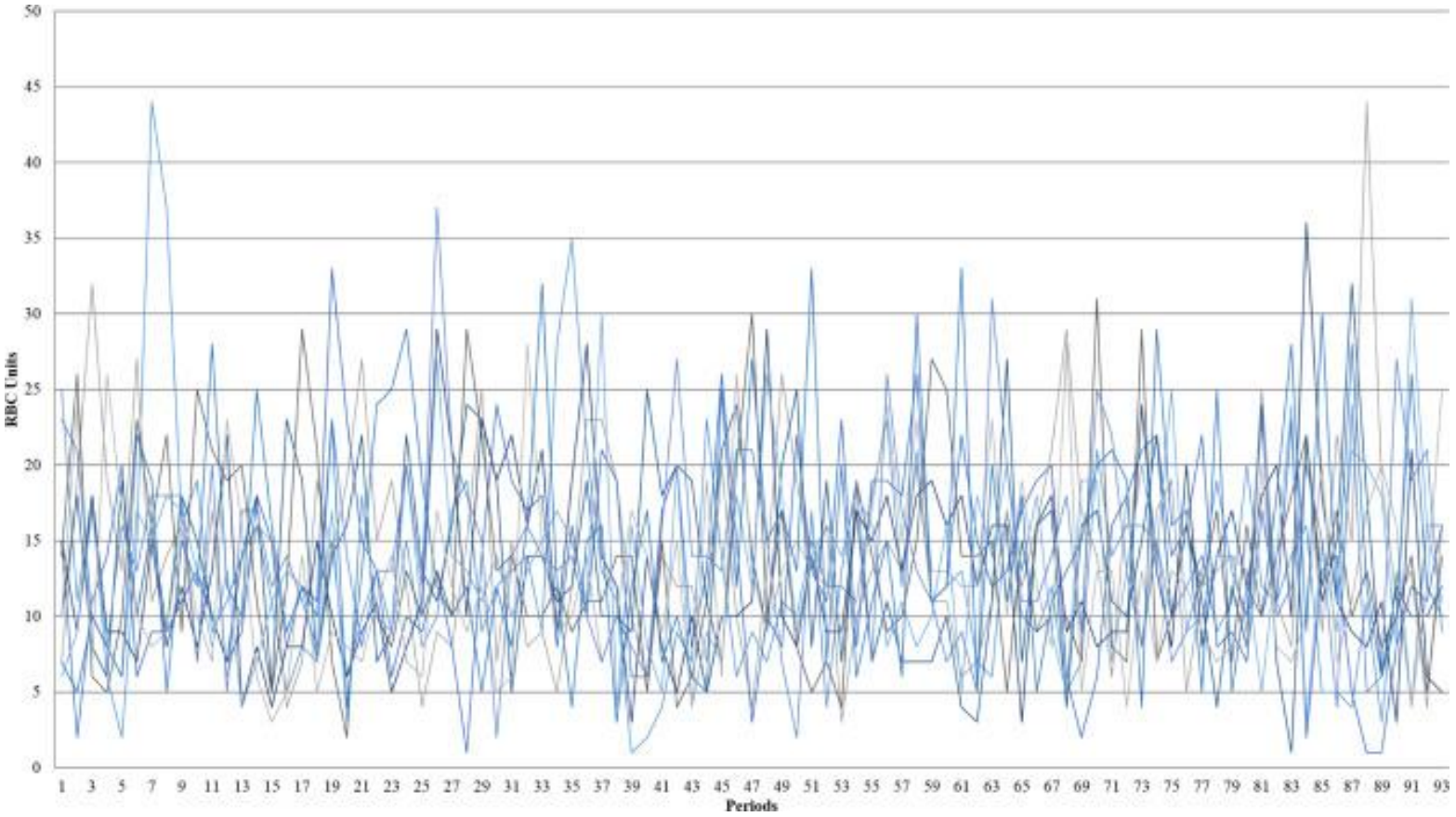


- Inventory management is needed to
  - Minimize operating costs
  - Minimize shortage and outdate
- The focus is on hospital red blood cell (RBC) inventories
  - Determining optimal RBC ordering policies
  - Costs from ordering, storage, shortage, and outdate

Background (2/3)

- Challenges in BSC inventory management:
  - Uncertain demand
  - Perishable nature of the product
  - Bias towards objectives other than cost-minimization

- The work is based on two two-stage stochastic programming models
  - Decisions grouped into first-stage and second-stage decisions
  - Stochastic nature represented by a set of possible scenarios considered simultaneously


RBC Units
Periods
0
5
10
15
20
25
30
35
40
45
50
1 3 5 7 9 11 13 15 17 19 21 23 25 27 29 31 33 35 37 39 41 43 45 47 49 51 53 55 57 59 61 63 65 67 69 71 73 75 77 79 81 83 85 87 89 91 93

Background (3/3)

- The first model aims to determine an optimal (R, S) inventory control policy
  - R = review periodicity, S = inventory target level
  - Set planning horizon
  - Considers several blood types and the possibility of substitution
- The second model considers transshipment
  - Aims to obtain optimal order and transshipment quantities
  - Review periodicity set to one day
  - Rolling horizon
  - Controls age of blood units
  - Single blood type

Objectives

- Compare the two models in terms **of how well they represent the problem**
- Compare the **computational performance** of the models
- Explore possibility of **combining best aspects** of the two models
  - Add tracking of blood unit age into first model
  - Add possibility of substitution into second model
  - Age differentiation

Methods

- Studying the papers on the two models
- Studying other relevant literature
- Implementation, use and editing of the models in Julia
- Structured comparison of features
  - Defining key performance indicators
  - Modeling capabilities
  - Computational performance

Sources

- Dillon, M., Oliveira, F. and Abbasi, B. (2017). A two-stage stochastic programming model for inventory management in the blood supply chain. *International Journal of Production Economics*, 187, pp.27-41.
- Dehghani, M., Abbasi, B. and Oliveira, F. (2018). Proactive transshipment in the blood supply chain: a stochastic programming approach. To be published in *European Journal of Operational Research* [Preprint].
- Other relevant literature on stochastic programming and blood supply chain inventory management

Schedule

Start	1/6/2018
Topic presentation	11/6/2018
Literature review and implementation of the models	6-7/2018
Analysis of the models	6-8/2018
Presenting the results	Fall 2018
Writing the report	6-8/2018