

Semiautomated Surveillance of Deep Surgical Site Infections After Cardiothoracic Surgery

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Disclosures

No potential conflicts of interest

The Netherlands

Cardiothoracic surgery (CTS)

- * ±16 000 procedures per year
 - * 16 specialized hospitals

Surgical site infections (SSI)

- * National incidence 2012–2015*
 - * Deep sternal SSI: 0.9%
 - * Deep harvest site SSI: 0.1%

* Reference data from PREZIES, the Dutch national surveillance network



SSI surveillance

Rationale

- * Internal motives
 - * Targeting preventive measures
 - * Evaluating interventions
 - * Within hospital quality indicator
- * External motives
 - * Public reporting
 - * Benchmarking

Traditional surveillance

- * Manual chart review
 - * Labour intensive
 - * Subjective and effort-dependent

Opportunity...

- * Electronic health records
 - * Semi-automated case-finding?

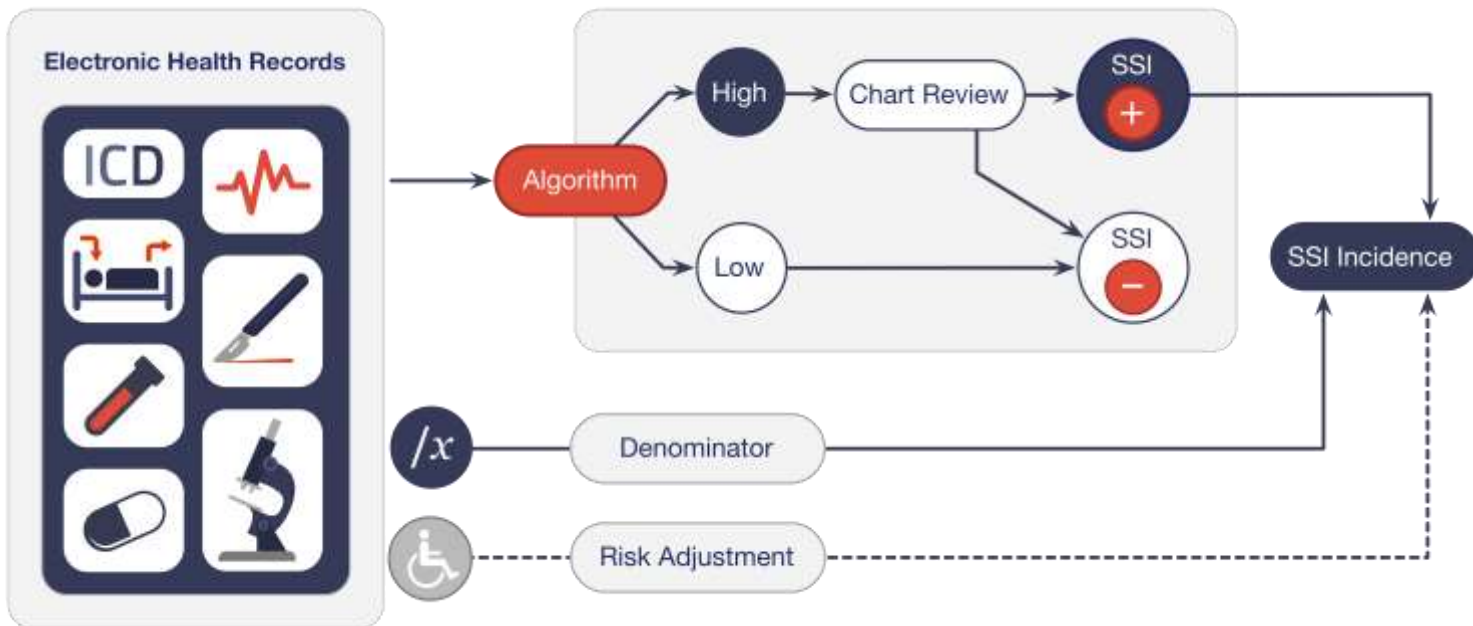


Objective

To develop an algorithm that relies on electronic routine care data to retrospectively classify patients as having a low or high probability of a deep SSI after cardiothoracic surgery



Semiautomated surveillance



Methods

Study population

- * ≥18 years
- * CTS through sternotomy
- * 2012–2015
- * UMC Utrecht

Outcome

- * Any deep SSI <90 days
 - * Deep incisional and mediastinitis
 - * Sternal and harvest site

Reference standard

- * Routine surveillance
 - * Microbiology-driven chart review
 - * National surveillance guidelines



Methods

Model development

- * Data elements
 - * Clinical and administrative
 - * 120 days after surgery
- * Algorithm development
 - * Optimizing PPV
 - * Ideally 100% sensitivity
 - * Accounting for practice variability



Results

Study population

- * 3467 procedures
 - * 2447 (70.6%) male
 - * Mean age 64 ±13 years

Routine surveillance




- * 719 with microbiological diagnostics
 - * PPV microbiology-driven chart review: 5.1%

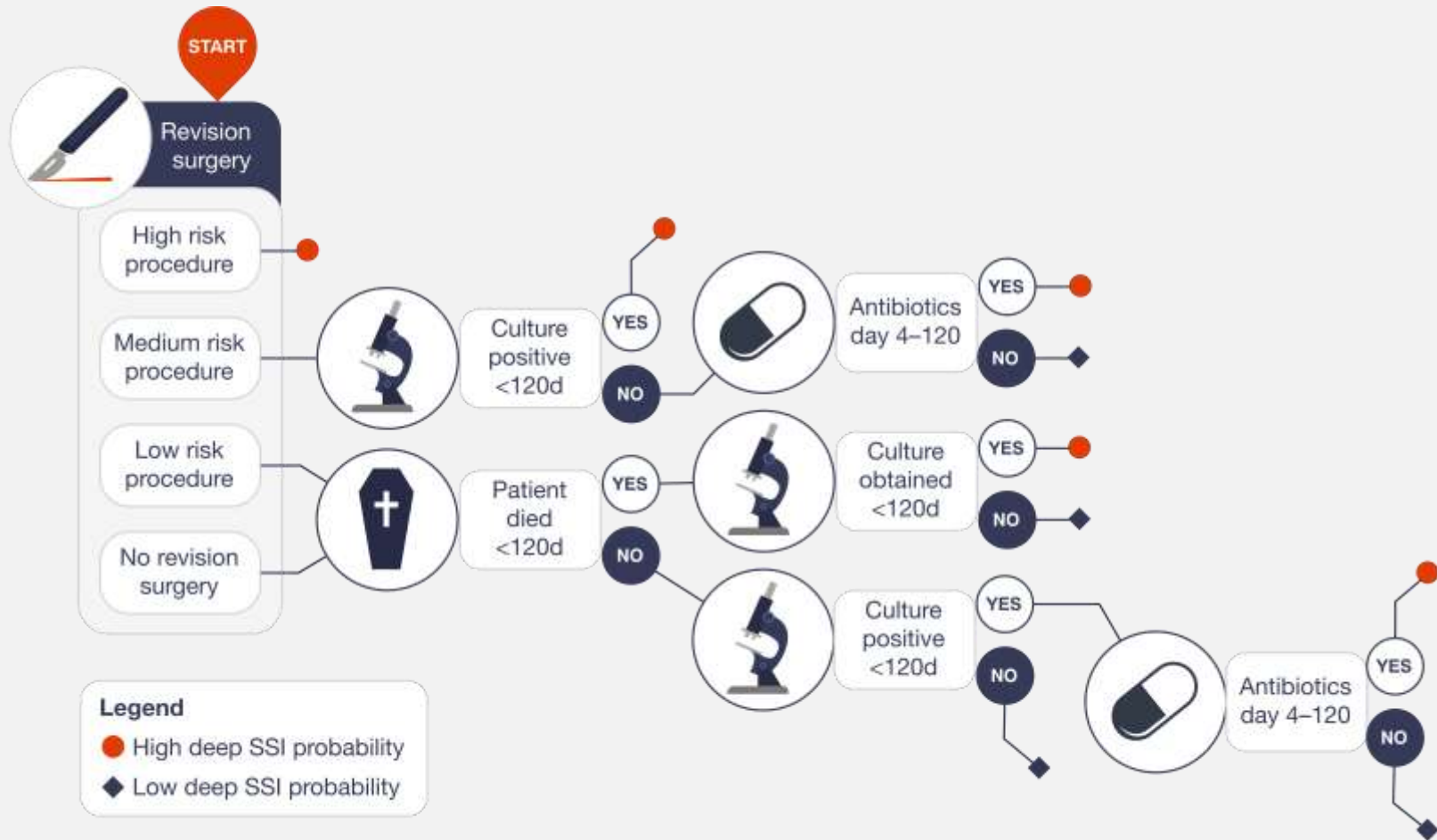
Deep SSIs

- * 37 deep SSIs
 - * 32 sternal SSIs
 - * Incidence: 0.9% (32/3467)
 - * 5 harvest site SSIs
 - * Incidence: 0.3% (5/1730)



Main predictors

	deep SSI (%)	no deep SSI (%)	PPV (%)
 ≥1 relevant culture obtained <120 days	100.0	19.9	5.1
≥1 relevant culture positive <120 days	94.6	6.6	13.4
 ≥1 antibiotic prescription between day 4 and 120	86.5	24.1	3.7
≥1 cardiothoracic surgical procedure <120 days	73.0	9.4	7.7
 ≥1 revision procedure <120 days with high risk code <ol style="list-style-type: none"> 1. surgical treatment sternal infection 2. correction thoracic dehiscence 3. wound debridement 	48.6	0.4	58.1



High risk surgical treatment sternal infection, correction thoracic dehiscence, wound debridement | **Medium risk** sternal refixation | **Low risk** any other CTS procedure

Algorithm

	deep SSI	no deep SSI		
high probability	36	226	262	97.3% sensitivity
low probability	1	3204	3205	93.4% specificity
	37	3430	3467	13.7% PPV
				100.0% NPV

1 = deep harvest site SSI, positive culture, no antibiotics, no surgery, alive after 120 days

Adding all positive cultures: 100.0% sensitivity 12.0% PPV (308 high probability)



Workload reduction

- * Manual chart review of all patients
 - * 3467 of 3467 charts
 - * ±867 charts per year
- * Microbiology-driven chart review
 - * 719 of 3467 charts
 - * ±180 charts per year
- * Semiautomated surveillance
 - * 262 of 3467 charts
 - * ±67 charts per year



* NNS: number needed to screen to identify 1 SSI



Discussion

- * Electronic data availability and accessibility
 - * Denominator for harvest site SSIs
 - * Multiple hospital information systems

- * Postdischarge surveillance
 - * Surveillance limited to operating hospital
 - * Transfer to other hospitals
 - * Treatment in outpatient setting
 - * Future: interfacility surveillance through data linkage?



Discussion

- * Variability in procedure coding and clinical practice
 - * Within and between hospitals
 - * Generalizability

- * SSI detection in the absence of microbiological diagnostics
 - * Surveillance definition: microbiological evidence not required



Conclusion

In hospitals with access to high quality electronic routine care data, semiautomated surveillance of deep SSIs after cardiothoracic surgery can reduce workload of chart review while maintaining high sensitivity.





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