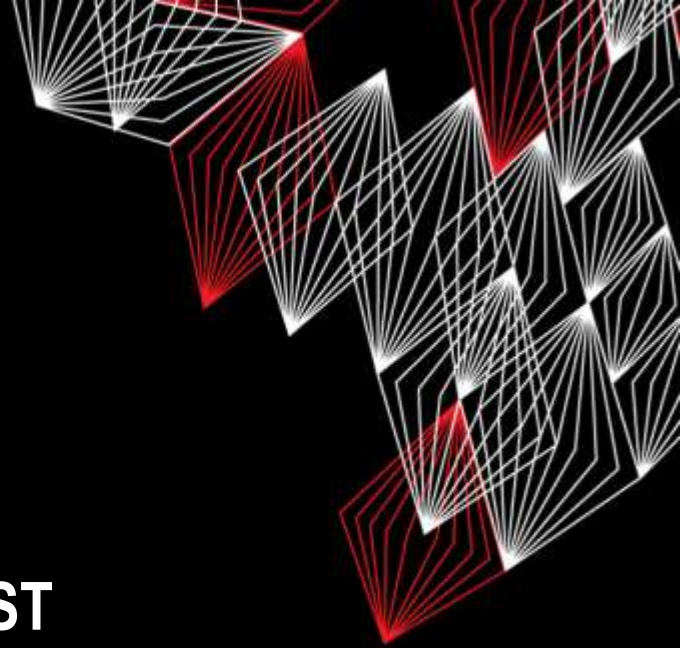


UNIVERSITY OF TWENTE.

# THE INTEGRATED EMERGENCY POST

THE SOLUTION FOR ED OVERCROWDING?





# AGENDA

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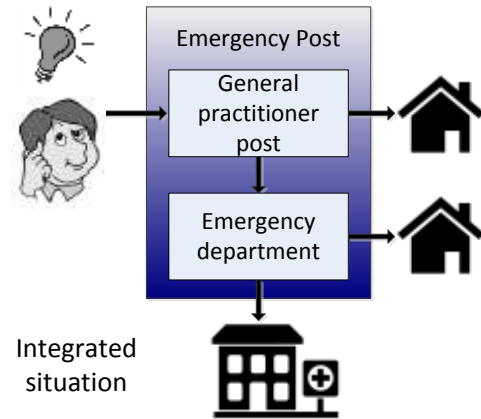
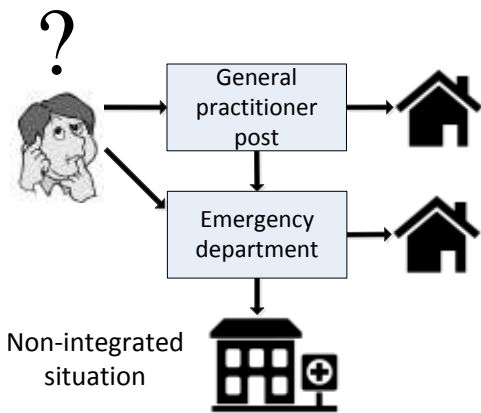


- Introduction
- ZonMw
- Simulation model
- Effects of the integrated emergency post
- Effects of organizational interventions
- View from the field





# INTRODUCTION





# ZONMW

## OPTIMAL LOGISTIC AND PATIENT PREFERENCES IN THE ACUTE CARE CHAIN

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- *to find an optimal design of an integrated emergency post where the right patient arrives at the right care provider without unnecessary delays and with an optimal allocation of means, while accounting for patient preferences.*
- *Bachelor- & Master assignments*



**ZonMw**



## WORK DONE SO FAR

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- Stakeholder analyses
- Conceptual-, and simulation model
- Model validation
- Evaluation of integration effect
- Optimization over interventions





# SIMULATION MODEL

## WHAT IS (COMPUTER) SIMULATION?

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- *“Simulation is the process of designing a model of a real system and conducting experiments with this model for the purpose either of understanding the behavior of the system or of evaluating various strategies (within the limits imposed by a criterion or set of criteria) for the operation of the system.” - Shannon, R.E., 1975*





# SIMULATION MODEL

## WHY USE COMPUTER SIMULATION?

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- Several distinct advantages
  - No disturbance of health care processes
  - Possible to test interventions before implementation
  - Can test many interventions quickly
  - Able to conduct scenario analyses
- And disadvantages
  - Time consuming
  - Requires extensive data
  - Approximate answers

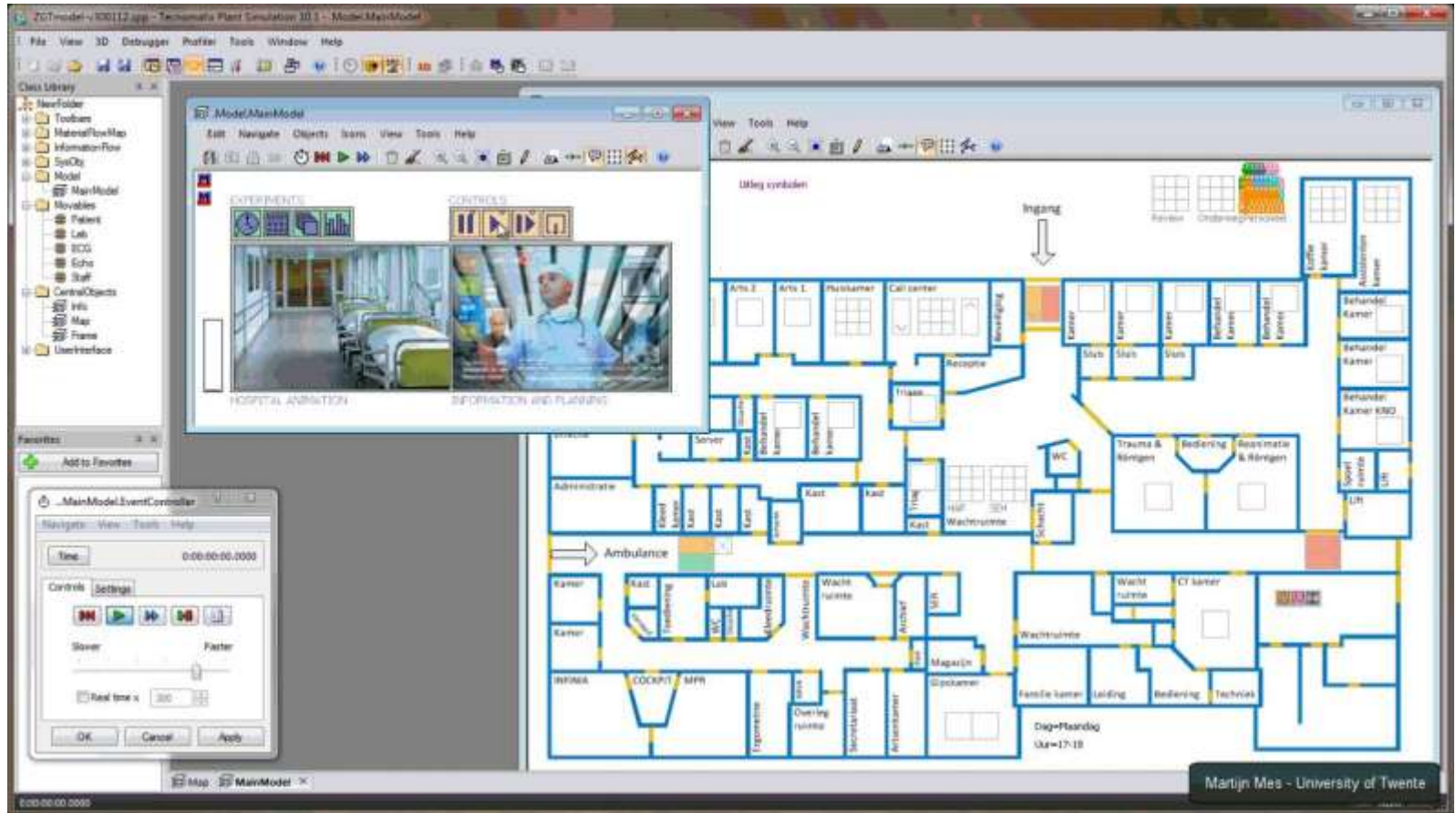






# SIMULATION MODEL

## MODEL OF THE INTEGRATED EMERGENCY POST ALMELO

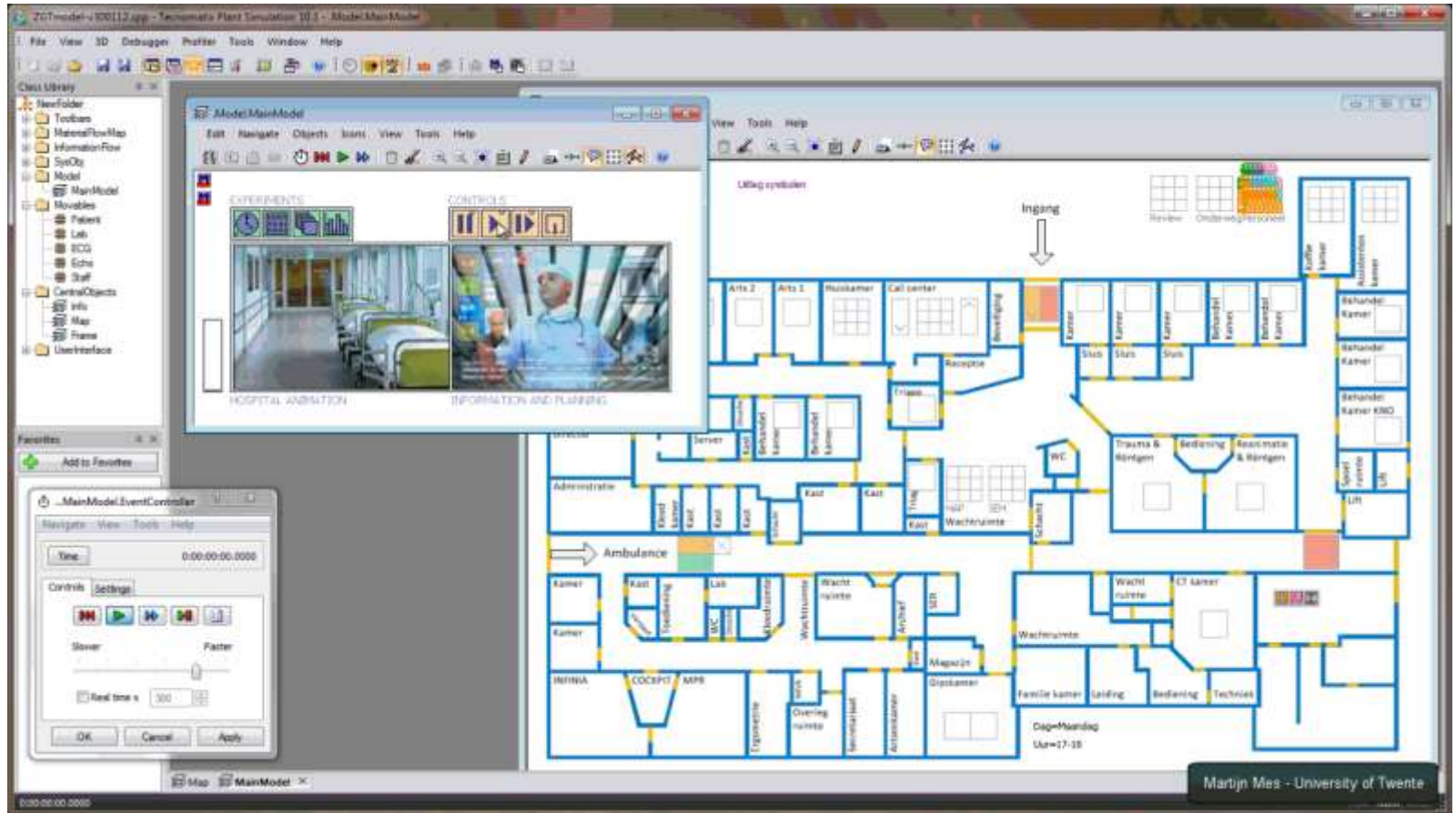






# SIMULATION MODEL

## MODEL OF THE INTEGRATED EMERGENCY POST ALMELO





# SIMULATION MODEL

## MODEL COMPONENTS

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- Three components in the simulation model
  - Patients
  - Staff and resources
  - Treatment- and supportive processes
- Flexible model design



# SIMULATION MODEL

## EXAMPLE OF INFORMATION TABLES

3.13

	string 0	real 1	real 2	real 3
string	Hour	WeekDay	Saturday	
1	0-1	3.13	3.87	
2	1-2	2.37	2.79	
3	2-3	1.90	2.62	
4	3-4	1.67	1.87	
5	4-5	1.33	1.73	
6	5-6	1.29	1.58	
7	6-7	1.27	2.48	
8	7-8	1.34	7.56	
9	8-9	0.00	22.77	
10	9-10	0.00	29.75	
11	10-11	0.00	32.19	
12	11-12	0.00	27.19	
13	12-13	0.00	24.94	
14	13-14	0.00	23.37	

	string 0	string 1	boolean 2	boolean 3	table 4
string	Hour	Beschrijving	EndAtHAP	EndAtSEH	Path
4	A4	Beller – Telefonische Hulp – Huis	false	false	table44
5	A5	Beller – Telefonische Hulp – SEH	false	true	table45
6	A6	Beller – Visite – Huis	false	false	table46
7	A7	Beller – Visite – SEH	false	true	table47
8	A8	Beller – Afspraak HAP – Consult HAP	true	false	table48
9	X1	Overig – SEH	false	true	table49
10	B1	Consult HAP – Huis	false	false	table410
11	B2	Consult HAP – Röntgen – Consult HAP – Huis	false	false	table411
12	B3	Consult HAP – Röntgen – SEH	false	true	table412
13	B4	Consult HAP – SEH	false	true	table413
14	C1	SEH – Triage – Anamnese – Diagnostiek – Behandeling – Ontslag – Huis	false	false	table414
15	C2	SEH – Triage – Anamnese – Diagnostiek – Behandeling – Ontslag – Overplaatsing	false	false	table415
16	C3	SEH – Triage – Anamnese – Diagnostiek – Behandeling – Ontslag – Opname	false	false	table416



# SIMULATION MODEL

## DEPENDENCIES AND PRIORITIZATION

- Dependencies and prioritization/appointment rules

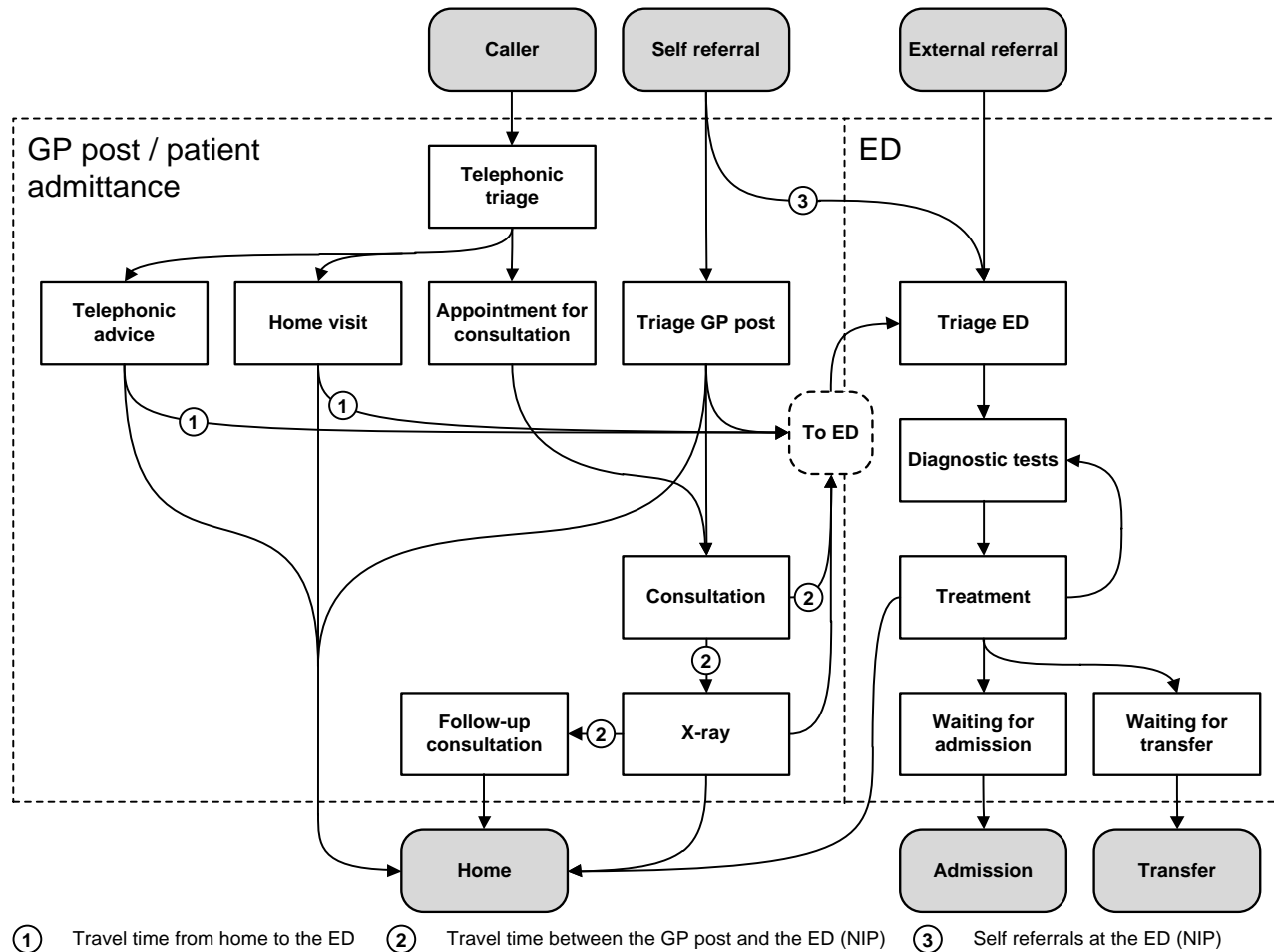
The screenshot shows a software window titled ".SysObj.Settings.Pad1" with a menu bar (File, Edit, Format, Navigate, View, Tools, Help) and a toolbar. Below the toolbar, the value "0.0123" is displayed. A table with 6 columns and 9 rows is shown. The columns are labeled "string 0", "real 1", "real 2", "real 3", and "real 4". The first row of the table has headers "Type", "U1", "U2", "U3", and "U4". The rows are numbered 1 through 8, with the first row (row 1) having a highlighted cell in the "real 1" column containing the value "0.0123".

	string 0	real 1	real 2	real 3	real 4
string	Type	U1	U2	U3	U4
1	A1	0.0123	0.0015	0.0004	0.0002
2	A2	0.0022	0.0010	0.0012	0.0108
3	A3	0.0137	0.0715	0.0727	0.0400
4	A4	0.3907	0.0467	0.0790	0.5544
5	A5	0.3601	0.0237	0.0051	0.0092
6	A6	0.1845	0.4008	0.1834	0.0278
7	A7	0.0097	0.0231	0.0050	0.0005
8	A8	0.0269	0.4316	0.6532	0.3571



# INTEGRATED EMERGENCY POST

## THE INTEGRATED AND NON-INTEGRATED EMERGENCY POST





# INTEGRATED EMERGENCY POST

## COMPARING THE INTEGRATED AND NON-INTEGRATED EMERGENCY POST

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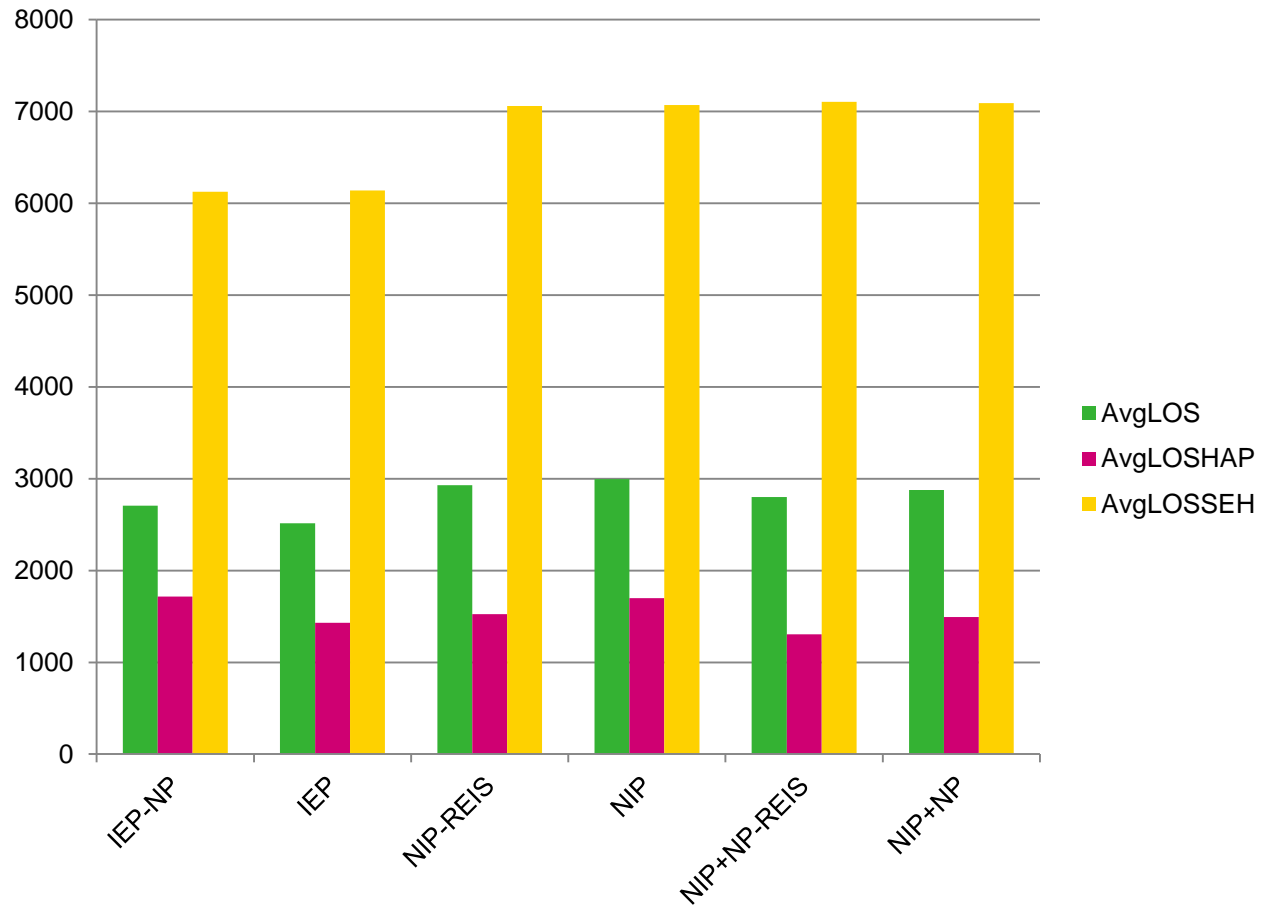
- Three changes
  - Self referral choice of care provider
  - Reduced travel time between GP and ED
  - Extra nurse practitioner
- Sensitivity analysis



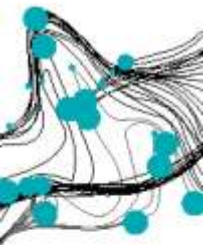


# INTEGRATED EMERGENCY POST

WHAT ARE THE EFFECTS OF INTEGRATION?







# INTEGRATED EMERGENCY POST

## DEFINING INTERVENTIONS

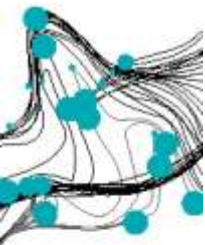
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In total 24 interventions are defined

- 5 process interventions
- 19 resource interventions
  
- Some examples
  - Using a single triage system
  - Extra diagnostic tests pre-treatment
  - Adding staff during busy hours
  - Treating ED patients in GP post rooms





# INTEGRATED EMERGENCY POST

## COMPARING INTERVENTIONS

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- Using length of stay as a performance indicator, the overall effect of interventions may be compared.
- Comparing the single effects of interventions is difficult, as there may be interaction between interventions





# INTEGRATED EMERGENCY POST

## COMBINING INTERVENTIONS



- Experimental designs
- To reduce the number of required runs, we divide the interventions over five experimental designs
- These are process-, staff-, equipment, resource pooling-, and schedule interventions.

Intervention A	Intervention B	Response
-	-	R1
+	-	R2
-	+	R3
+	+	R4

- From these interventions, we pick the most promising ones, and recombine these in a new experimental design.





# INTEGRATED EMERGENCY POST

## INTERVENTION OUTCOMES BY INTERACTION EFFECTS

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- What stands out from evaluating the interventions and interaction effects?
  - Certain extra staff types reduce LOS
  - Pooling resources have a positive effect on both GP post and ED
  - Several process interventions reduce ED LOS
  - Diagnostics have no effect
- Five promising interventions





# INTEGRATED EMERGENCY POST

## CONCLUSIONS

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- The formulated most promising interventions all show an improvement over the current situation.
- Comparing them individually, the greatest effects on the ED are using a single triage system, utilizing the GP post gatekeeper function, as well as ordering more tests before treatment through protocol.
- The greatest effect on the GP post LOS, is adding an extra physician assistant during the weekend shift, as well as during the starting hours of the IEP.
- When resources are pooled, LOS is reduced, increasing the overall IEP effectiveness, as such, the staff member addition with the greatest effect is a PA.



## View from the field

Intervention

Simulation Model

Discussion

Future work



## Intervention

Pilot shared resource GP post and ED; Physician Assistant  
3 weeks Monday – Friday 17:00-20:00 hours

Waiting time GP post 9:40 min → 7:36 min

Waiting time ED 18 min → 12 min

LOS ED 2:07 hrs → 2:05 hrs (no significant decline)



## Intervention - conclusion

Decline waiting time GP post  
No significant effect ED

Higher patient safety because less transfers between staff.  
Patient friendly: one caregiver

But....

not enough work for GP's with a PA on working evenings

## Simulation Model

Insight for managers and specialist;  
Simulation tutorial session;



Insight added value IEP

## Discussion

Simulation model confirms assumptions;

- staff roster
- ED specialists

Simulation model supports decision making;

- approval vacancy ED specialist

Real world changes fast;

- ED specialist
- pre-diagnostic test
- patient flows

Managing patient perspectives

## Future work

Financial study benefits integration GP post and ED → IEP

Use simulation model to show effects integration for non-integrated emergency posts.



Thank you for your attention



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