



Rehabilitation treatment planning

An integral multidisciplinary approach

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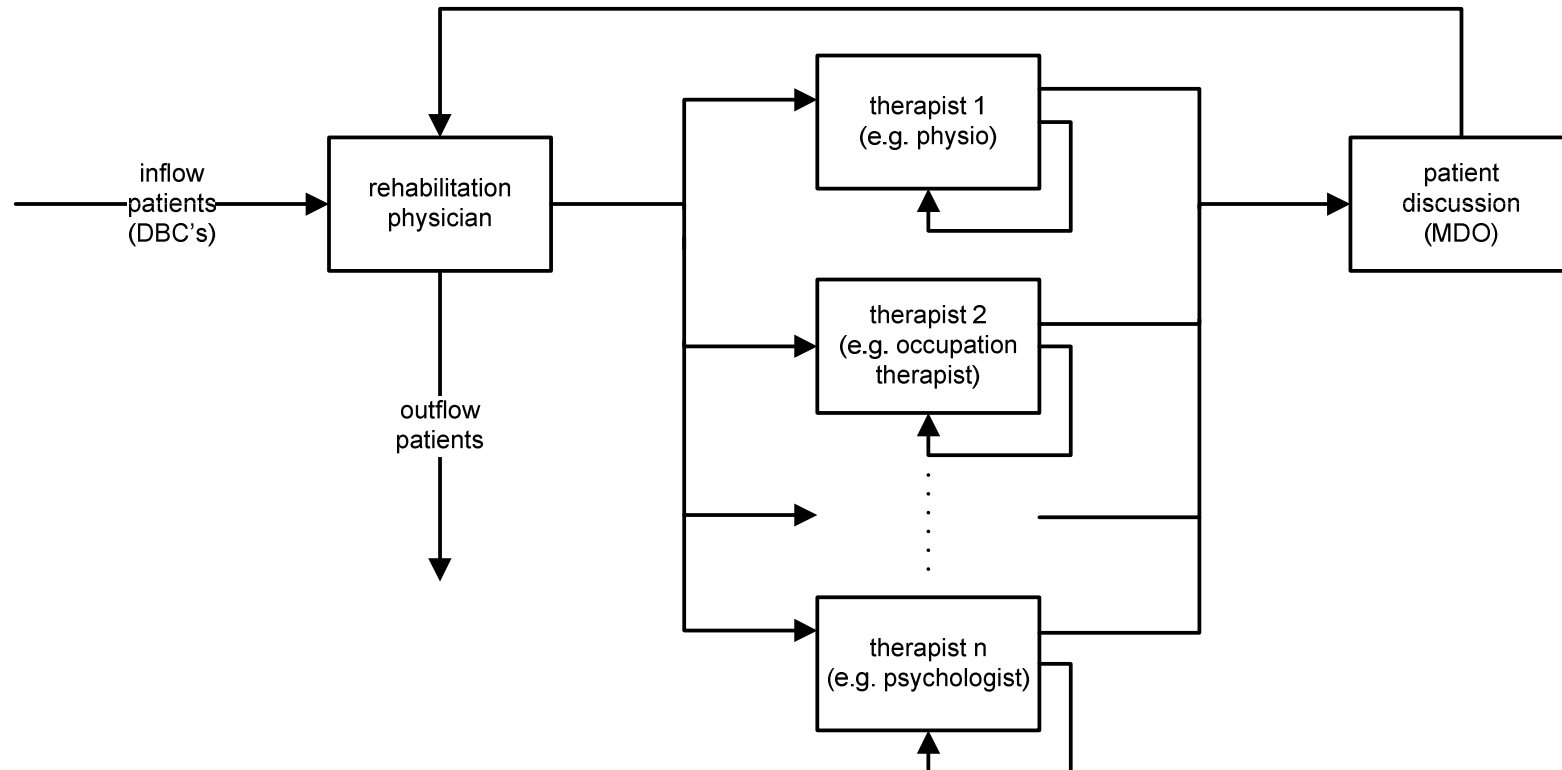
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Overview

- Background
- Research objective
- Literature
- Model
- Results
- Future research

Outpatient clinic Rehabilitation

Diagram patientflow:



Background – Research objective – Literature – Model – Results – Future research

Planning Rehabilitation

Current practice:

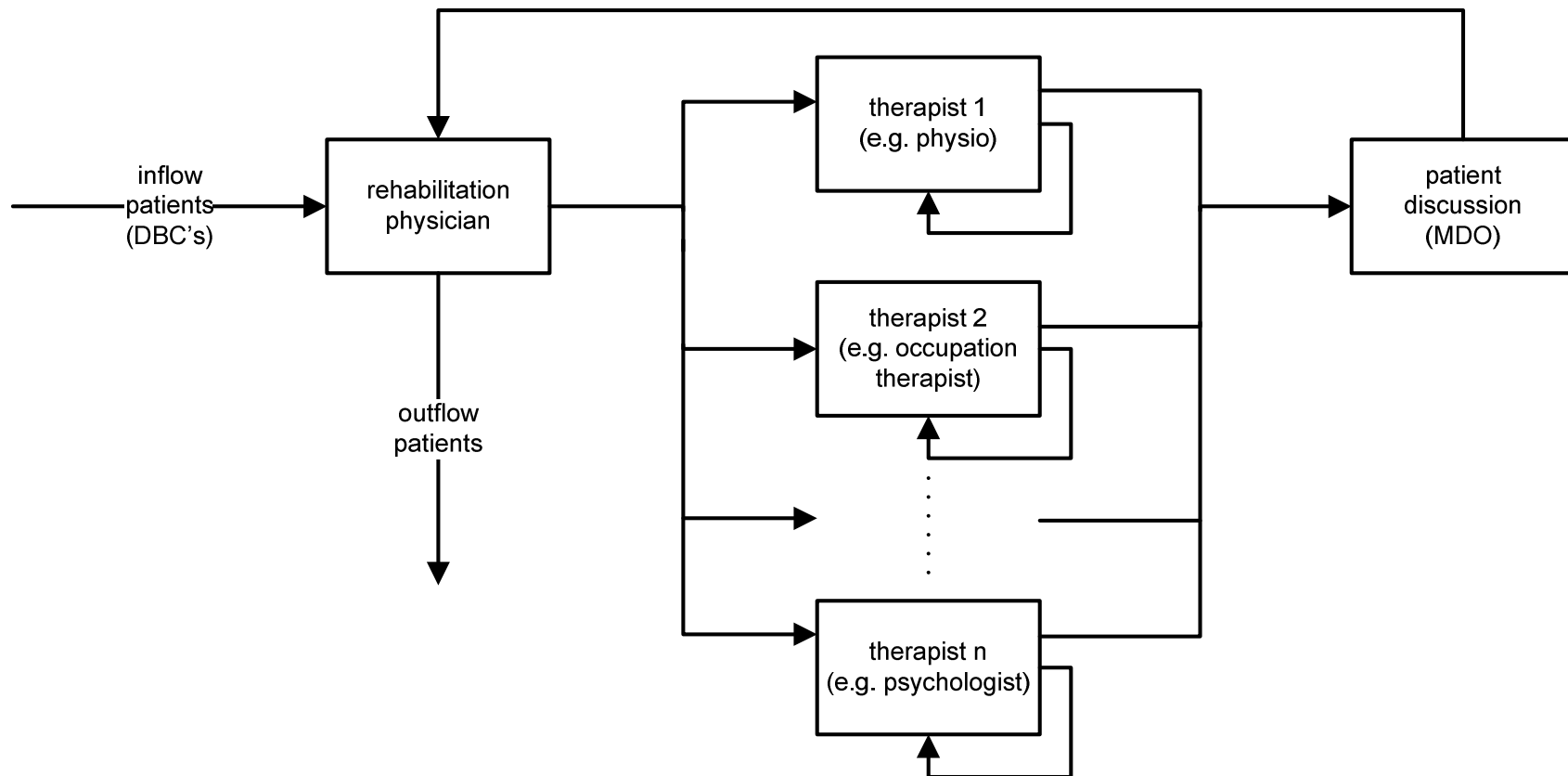
- Lack of coordination between disciplines
- Appointments are planned one by one
- Little knowledge about patient-mix

Results in:

- No simultaneous start of disciplines
- Few combination-appointments
- Discontinuity of rehabilitation process
- Utilization of therapists hard to control
- Number of therapists needed unclear
- Hard to control desired patient-mix

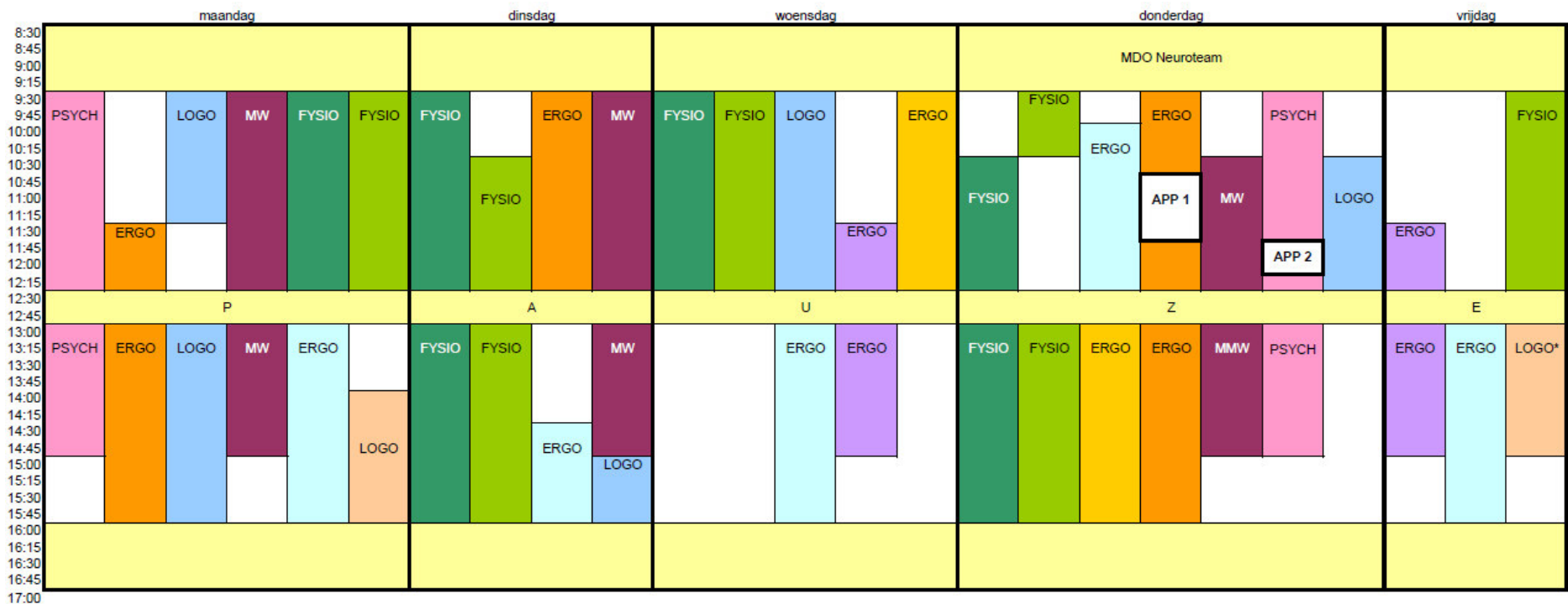
Background – Research objective – Literature – Model – Results – Future research

Series of appointments



Background – Research objective – Literature – Model – Results – Future research

Week schedule



Background – Research objective – Literature – Model – Results – Future research

Research objective

The aim of this project is to develop an algorithm for planning series of appointments for rehabilitation-patients, resulting in a good schedule for both patients and professionals.

■ Algorithm for patient scheduling

○ Input

a patient request (series of appointments that has to be planned)

○ Output

one or more proposals of a series of appointments for the patient

Performance indicators

- Access time
- Utilization
- Simultaneous start disciplines
- Lead time
- Combination-appointments
- Unplanned appointments
- Rejected patients

Literature

■ Planning appointments for rehabilitation patients

- Only single appointment or appointments on single day
Yedehalli (2005), Chien et al. (2008 & 2009)
- No treatment plans

■ Planning treatment plans

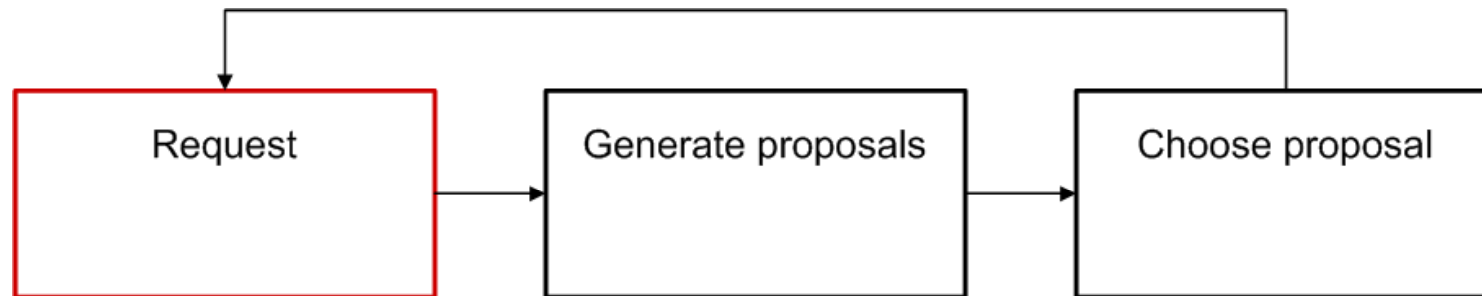
- Only for cancer patients Choi (2009), Conforti et al. (2008 & 2009)
- Approach: integer linear program

Still underexposed in research:

combination of planning treatment plans and

- combination-appointments
- taking into account the future

Overview approach



Background – Research objective – Literature – **Model** – Results – Future research

Treatment plans

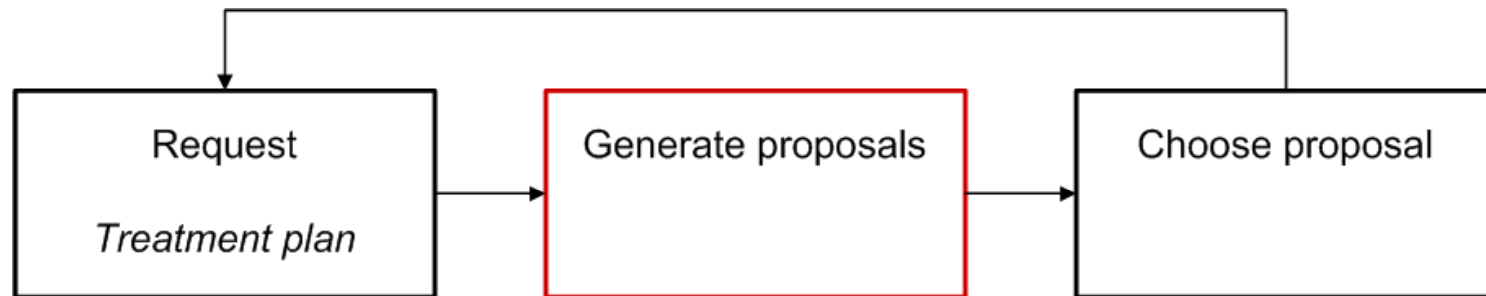
- Information about appointments that should be planned for a patient
 - Disciplines
 - Number of appointments
 - Duration
 - Moment
 - Extra information

Background – Research objective – Literature – **Model** – Results – Future research

Treatment plans

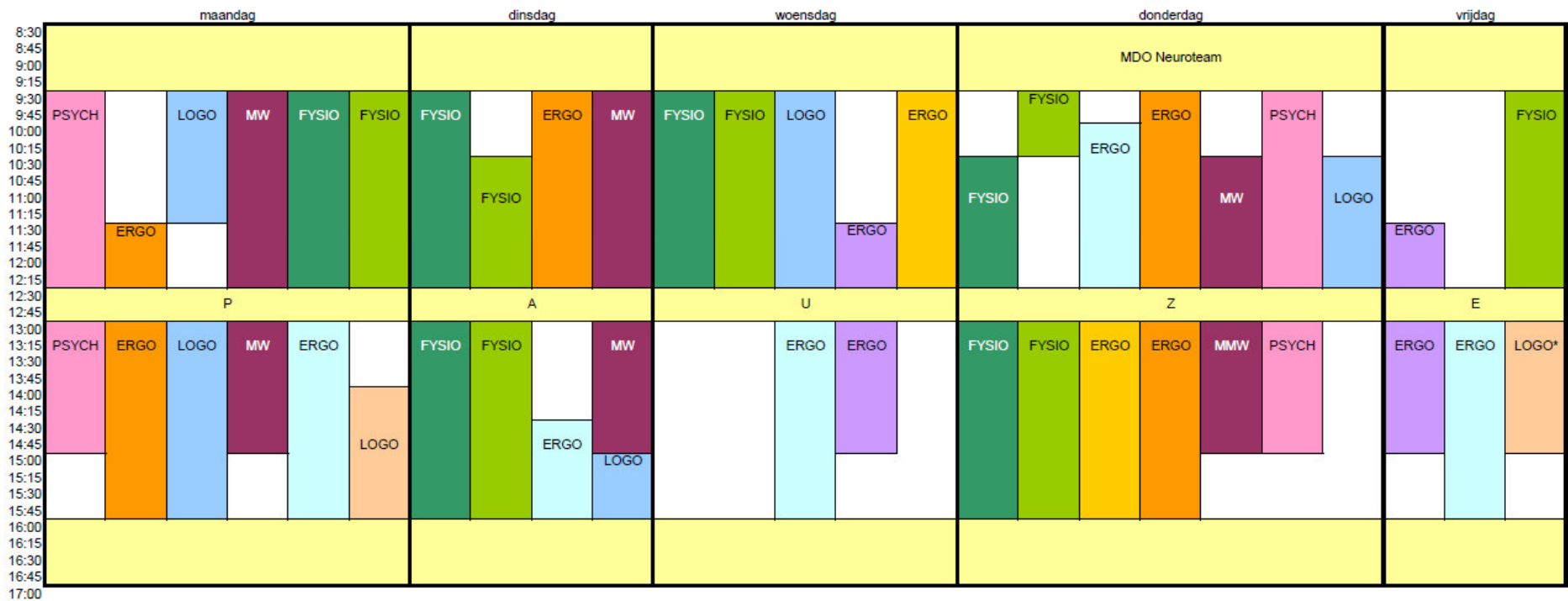
DBC(s): 0888									
Week	INPLANNEN BIJ						BEHANDELING		OPMERKINGEN
	Rev. arts	Disciplines					% inplannen	duur	Opmerkingen over de afspraak
		Fysio	Ergo	Logo	MMW	Psych			
1	x						100	60	
2		x	x				100	60	Moet op dezelfde dag als afspraak MMW.
		x					100	60	
			x				100	60	
					x		100	60	
3						x	60	60	Drie afspraken bij Fysio mogen niet op achtereenvolgende dagen (moet steeds een dag tussen zitten).
	x						100	15	
		x					100	30	
		x					100	30	
		x					100	30	
			x				100	60	
					x		70	60	
					x	60	60		

Overview approach



Background – Research objective – Literature – **Model** – Results – Future research

Appointments per patient



Appointments per patient

- ILP – one patient at a time

- appointments a
therapists h
timeslots t

- Decision variables:

- For each discipline within series: choose therapist
- For each appointment within series: choose starting timeslot

x_{aht} 1 if appointment a is assigned to therapist h and starts in timeslot t
0 otherwise

Appointments per patient

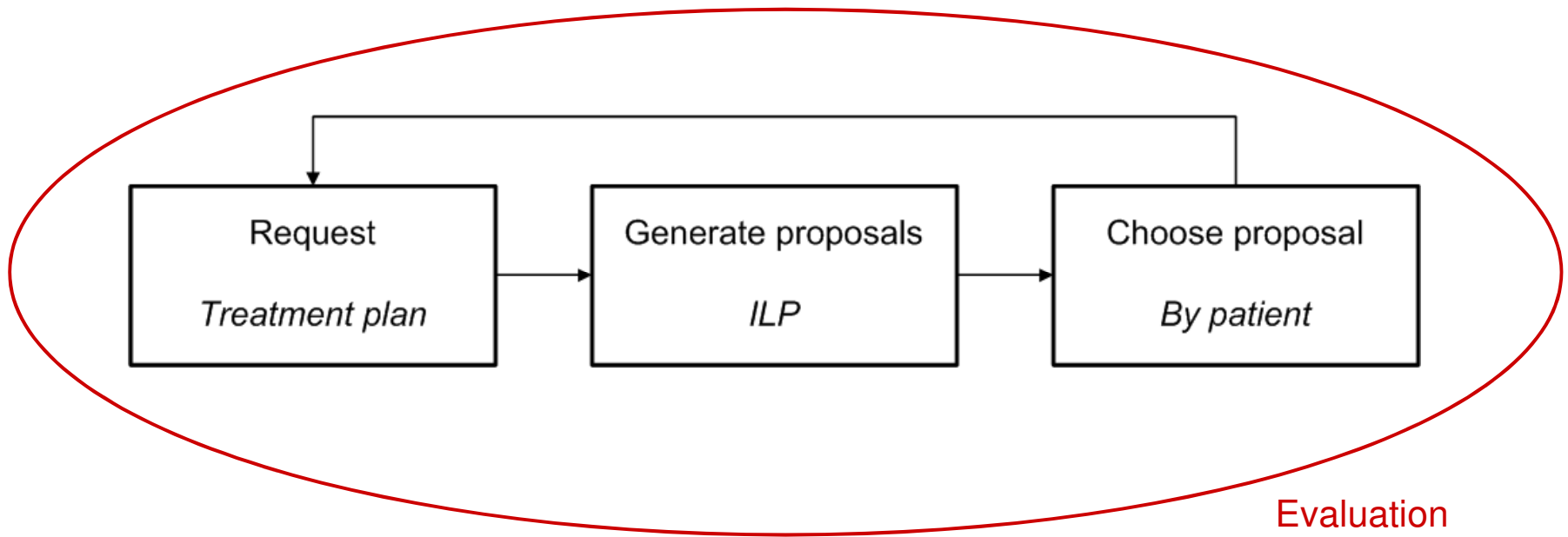
- ILP – one patient at a time
- Objective:
 - Performance indicators
 - Planning according to treatment plan
 - Avoid 'gaps' in schedules therapists
 - Repeat starting timeslots
 - Spread appointments in same week
 - Specialized therapists

Minimize weighted penalty costs

Appointments per patient

- ILP – one patient at a time
- Constraints:
 - Some examples:
 - No more than 3 appointments per day
 - Treatments by one therapist per discipline
 - Precedence relations

Overview approach



Evaluation

Simulation

Case

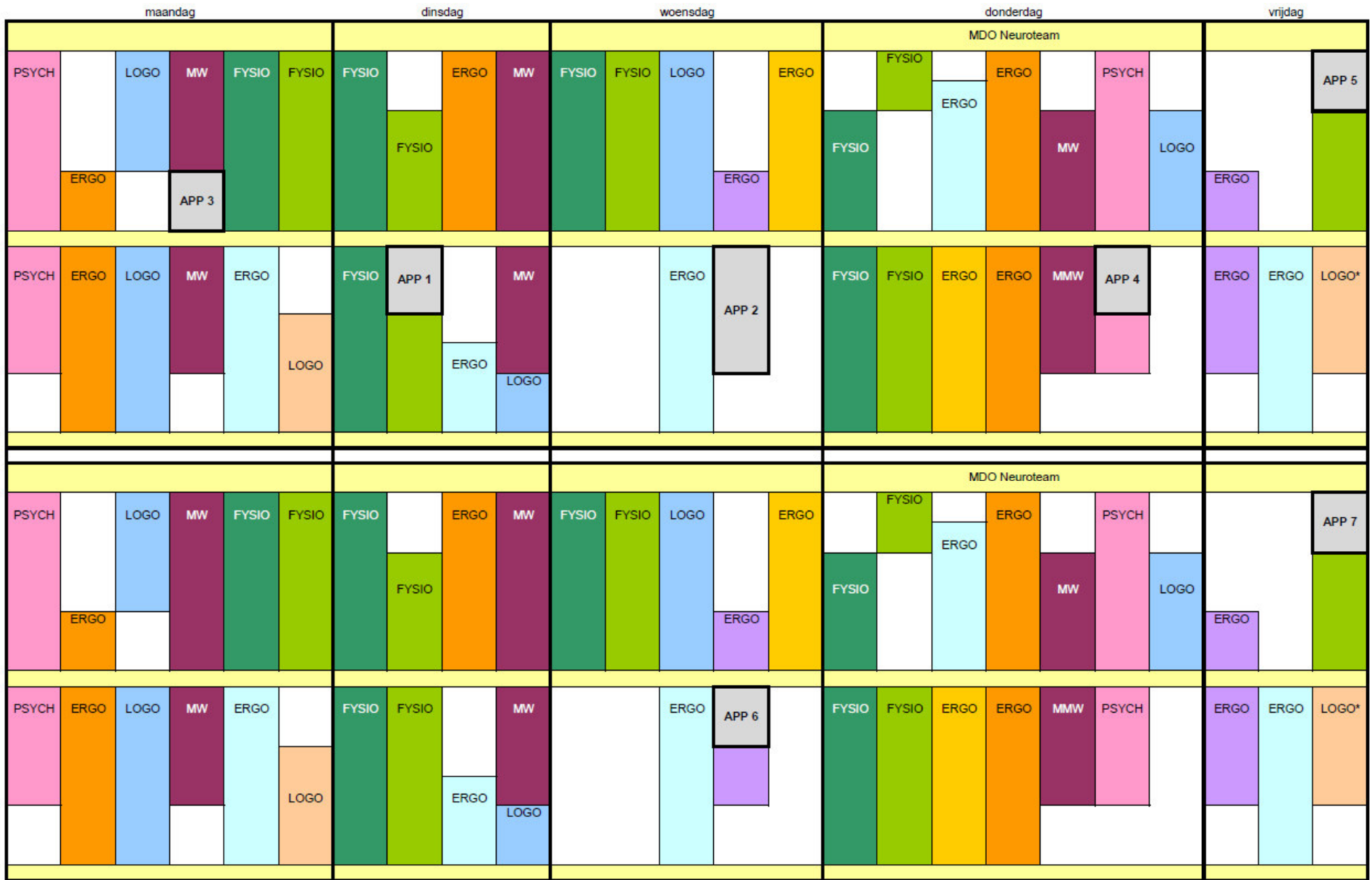
- Outpatient clinic Rehabilitation AMC
 - No treatment plans, except for one patient group
 - Data-gathering:
 - Very little information from physicians
 - Poor information from databases
 - Assumptions based on information from databases

Background – Research objective – Literature – Model – **Results** – Future research

Results

Patient request:

Appointment	Discipline	Duration (min.)
1	Physio therapist	60
2	Occupation therapist	120
3	Social worker	60
4	Psychologist	60
5	Physio therapist	60
6	Occupation therapist	60
7	Physio therapist	60



Background – Research objective – Literature – Model – **Results** – Future research

Future research

- Continuation appointments
 - Scheduling virtual appointments

- New patients
 - Reservations
 - Hard
 - With overflow
 - Dynamic
 - Costs per timeslot

Future research

- Tactical level
 - Calculating optimal week schedules

- Strategic level
 - Calculating number of therapists needed
 - Controlling inflow of patients