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Financial and Economic Modelling for Telehealth

HEDS, ScHARR
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Why financial modelling?

Traditionally, health economists have been obsessed with the NHS/PSS incremental cost-effectiveness ratio (ICER) 'Cost per quality adjusted life year (QALY)'.

- Ignores the importance of time profiles to implementation (not a problem when it's tablet A vs tablet B)
- Ignores the importance of budgets (not a problem when there can be only one supplier, e.g. tablet A vs tablet B)
- Uses average costs and assumes total flexibility of resources (which tends to average out at a national level, but can be completely wrong locally)

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Our Aim/Objective

- Our financial model aims to produce a standard cost effectiveness analysis (CEA), but provide operational level detail (outputs and inputs), financial flows and time profiles for a bespoke local telehealth service
- Aim: To build a flexible and comprehensive financial model incorporating the most up-to-date methodologies to allow a number of telehealth scenario evaluations

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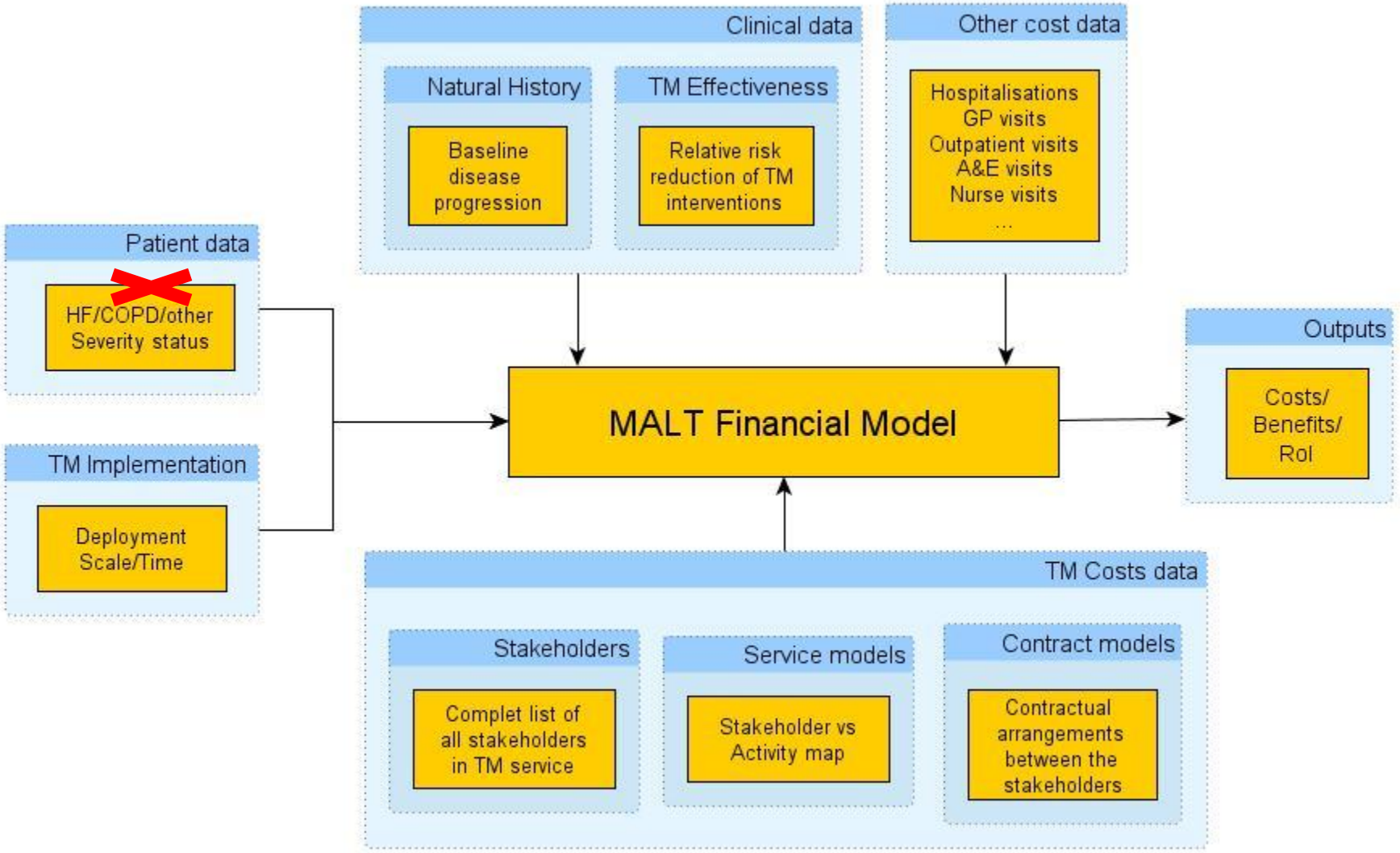
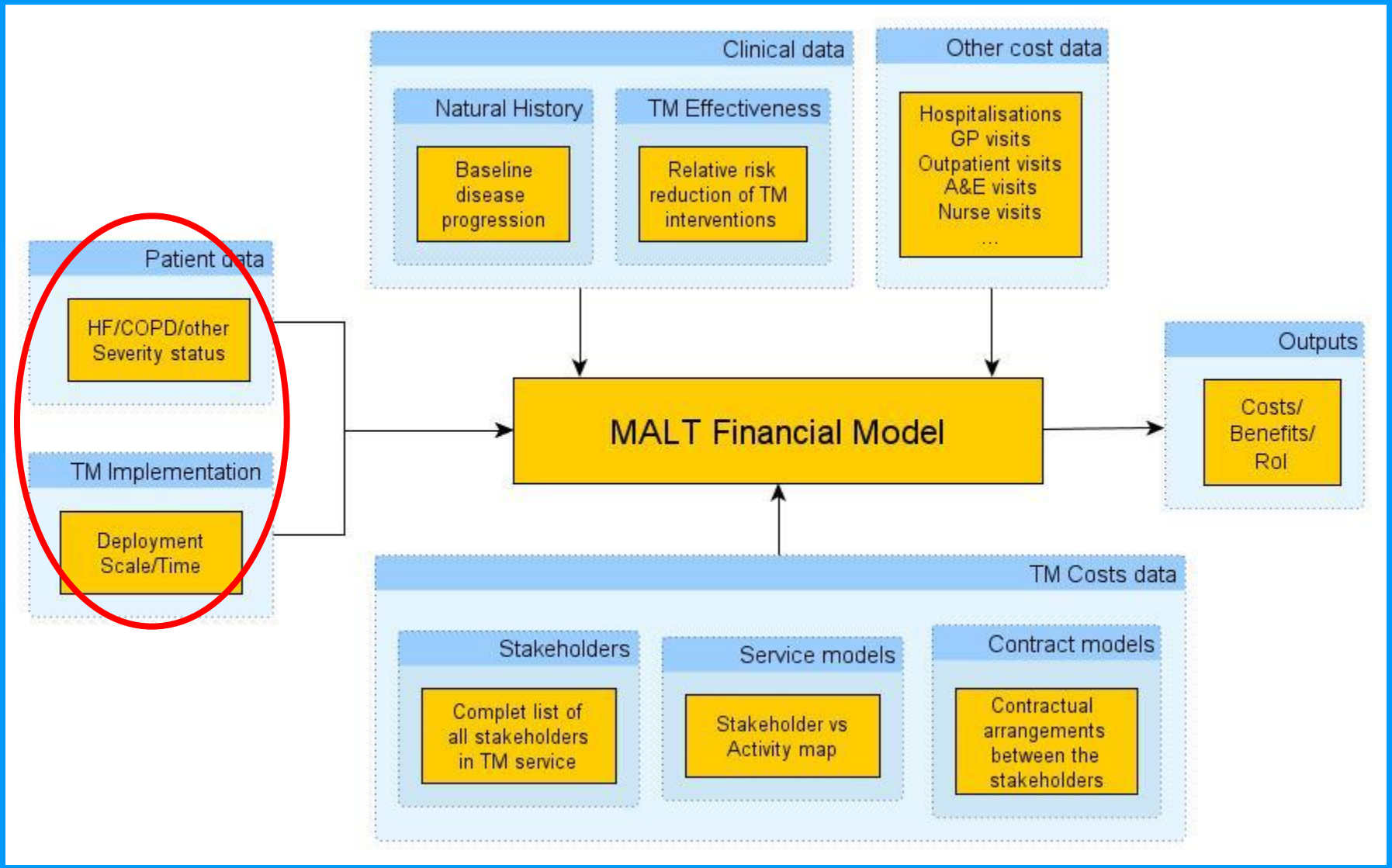
Financial Model Structure



Potential deployment scenarios



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Initial patient cohort

- Severity modelled using the number of hospitalisations in last year using HES (Hospital Episode Statistics) data
- 0, 1, 2, and 3+ hospitalisations in last year
- Flexibility to use other risk stratification tools e.g. disease specific (i.e. NYHA class for HF) or Kaiser risk classification

Initial cohort	Severity A	Severity B	Severity C	Severity D	Total size specified
Initial population	3000	2000	1500	1000	7500

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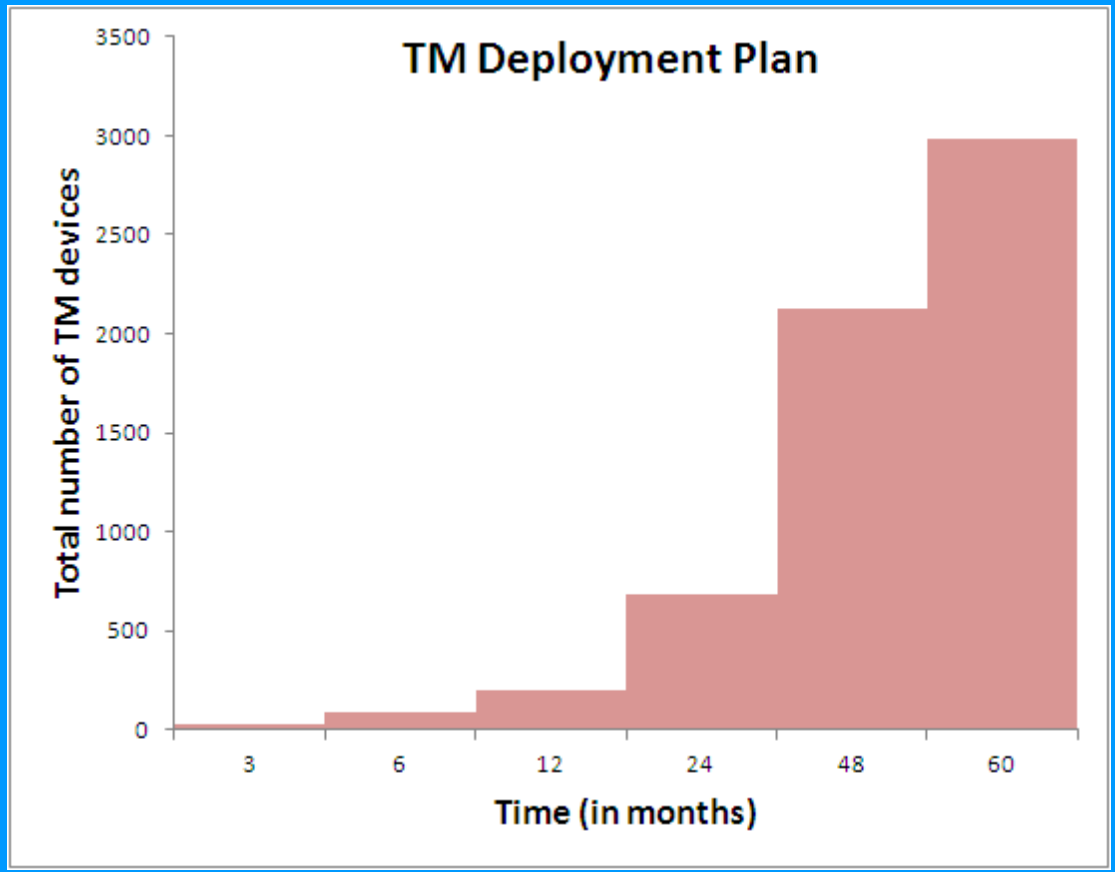
Implementation scenarios

- Modelled as number of devices deployed at different time points



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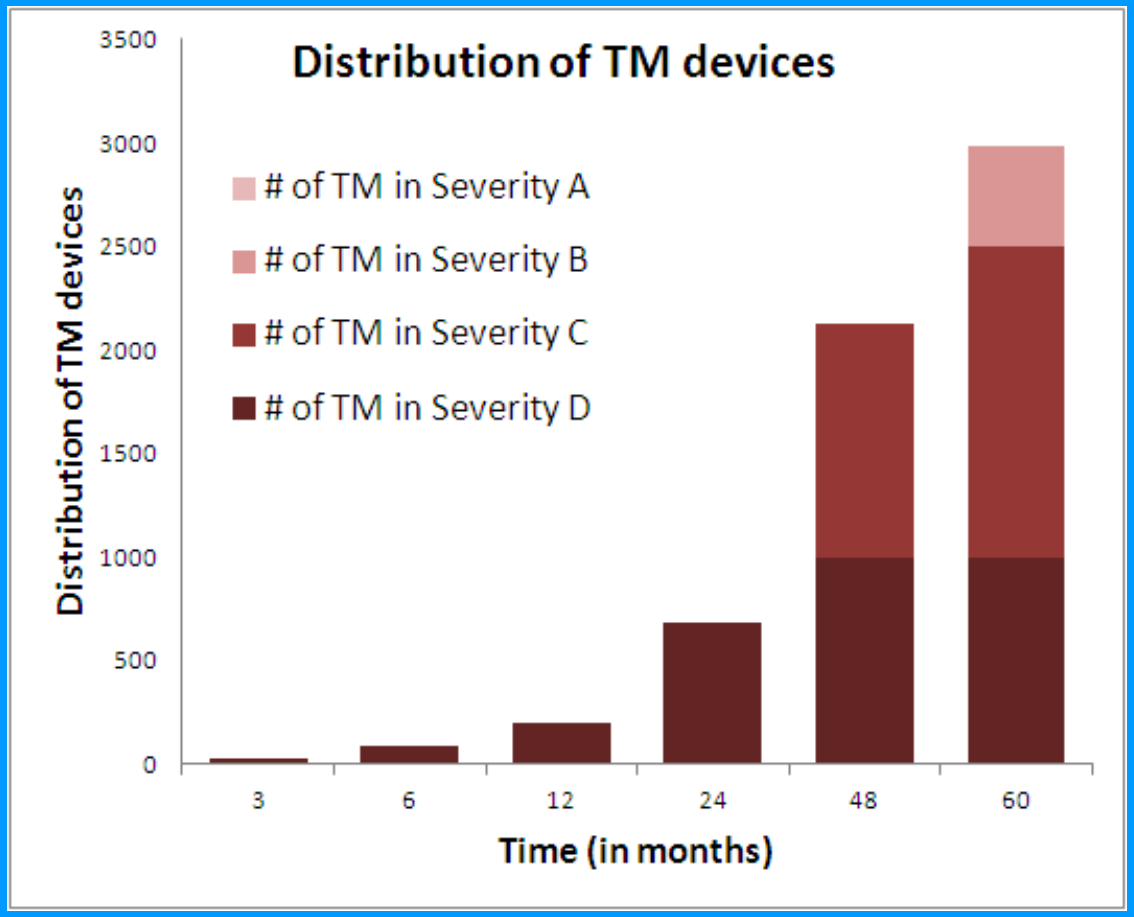
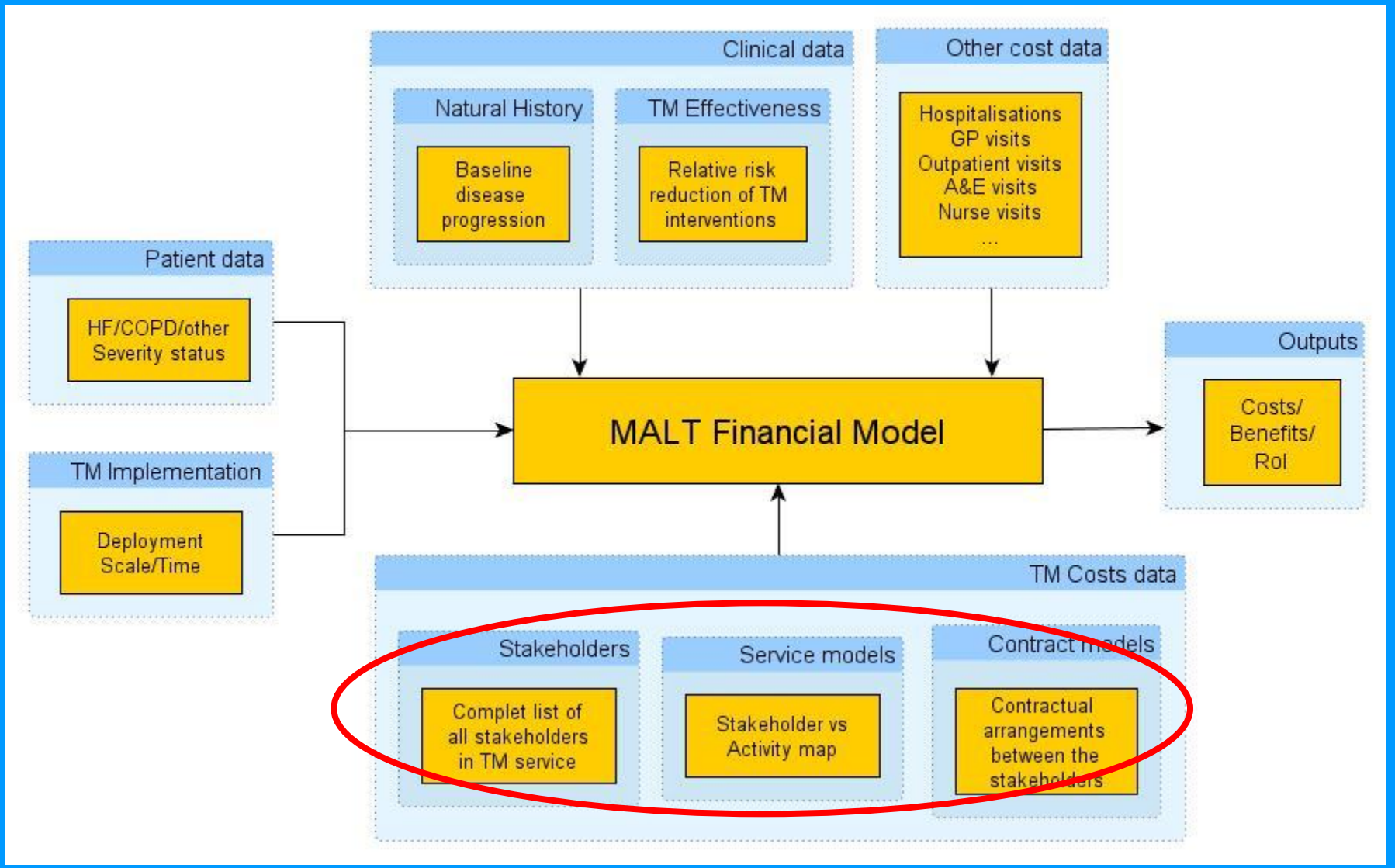
Deployment strategy

- Flexibility to modelled different types of deployment strategies (based on severity)



Potential contractual scenarios



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Stakeholder map

- List of the various stakeholders and their definitions
- Used to allocate costs at the end of the model

Stakeholder	Type	ID
TH World	Industry	1
Wyke 6th form College	Local Authority	2
Trumpton	CSU	3
Harmony	CCG	4
Dell	Manufacturer	5
Trumpton	FT	6
Camberwick Green	CSU	7

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Cost estimation (using the service and contract type)

Activity	Supplier ID	Payer ID	Fixed Cost	Cost per patient	One-off costs
Device costs	1	5		£125	
Installation and training	3	5		£150	
Monitoring/hosting	2	5		£200	
Communications	2	5	£20,000		
Technical triage	2	5		£5	
Clinical triage (1st and 2nd line)	4	5		£50	
Maintenance/back office/admin	2	5		£25	
Service review and innovation/modification	4	5			£24,000
Removal	3	5		£40	

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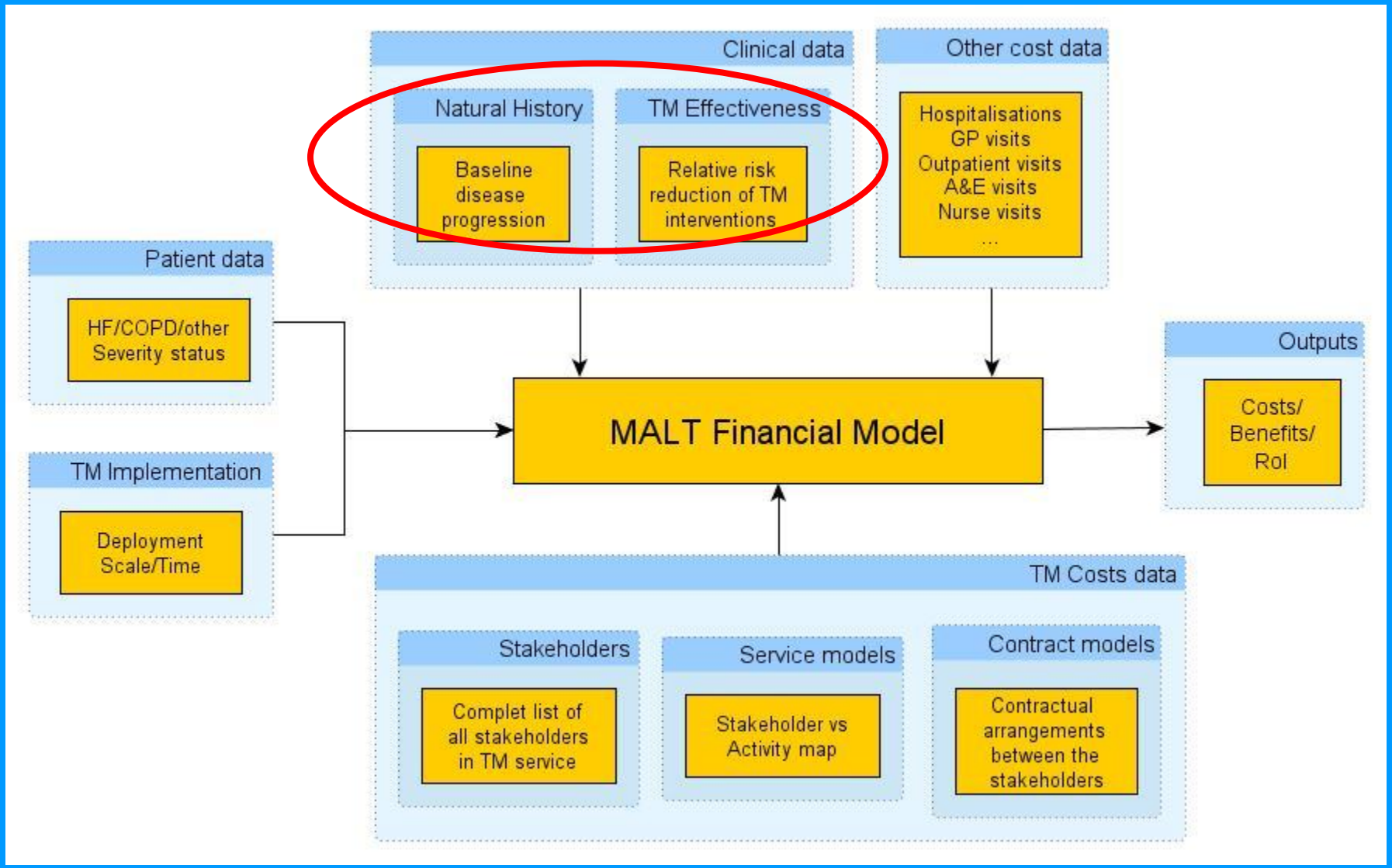
Clinical data



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Disease progression data

- HES data analysis to estimate baseline disease progression, data analysis can be tailored for local settings & diseases

	Severity A	Severity B	Severity C	Severity D	Death
Severity A	98.82%	0.68%	0.00%	0.00%	0.51%
Severity B	0.51%	93.37%	5.11%	0.34%	0.68%
Severity C	0.17%	2.29%	95.34%	1.00%	1.20%
Severity D	0.00%	0.51%	3.65%	90.51%	5.33%

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Effectiveness of telehealth

- Effectiveness of TM modelled as hazard ratio parameters estimated from a network meta-analysis (NMA) of telehealth studies

	All-cause mortality		HF-hospitalisation	
	HR	95% PrI	HR	95% PrI
TM	0.76	(0.30, 1.91)	0.95	(0.59, 1.62)

- HTA report on cost-effectiveness of telehealth for patients with heart failure, accessible at http://www.journalslibrary.nihr.ac.uk/hta/volume-17/issue-32

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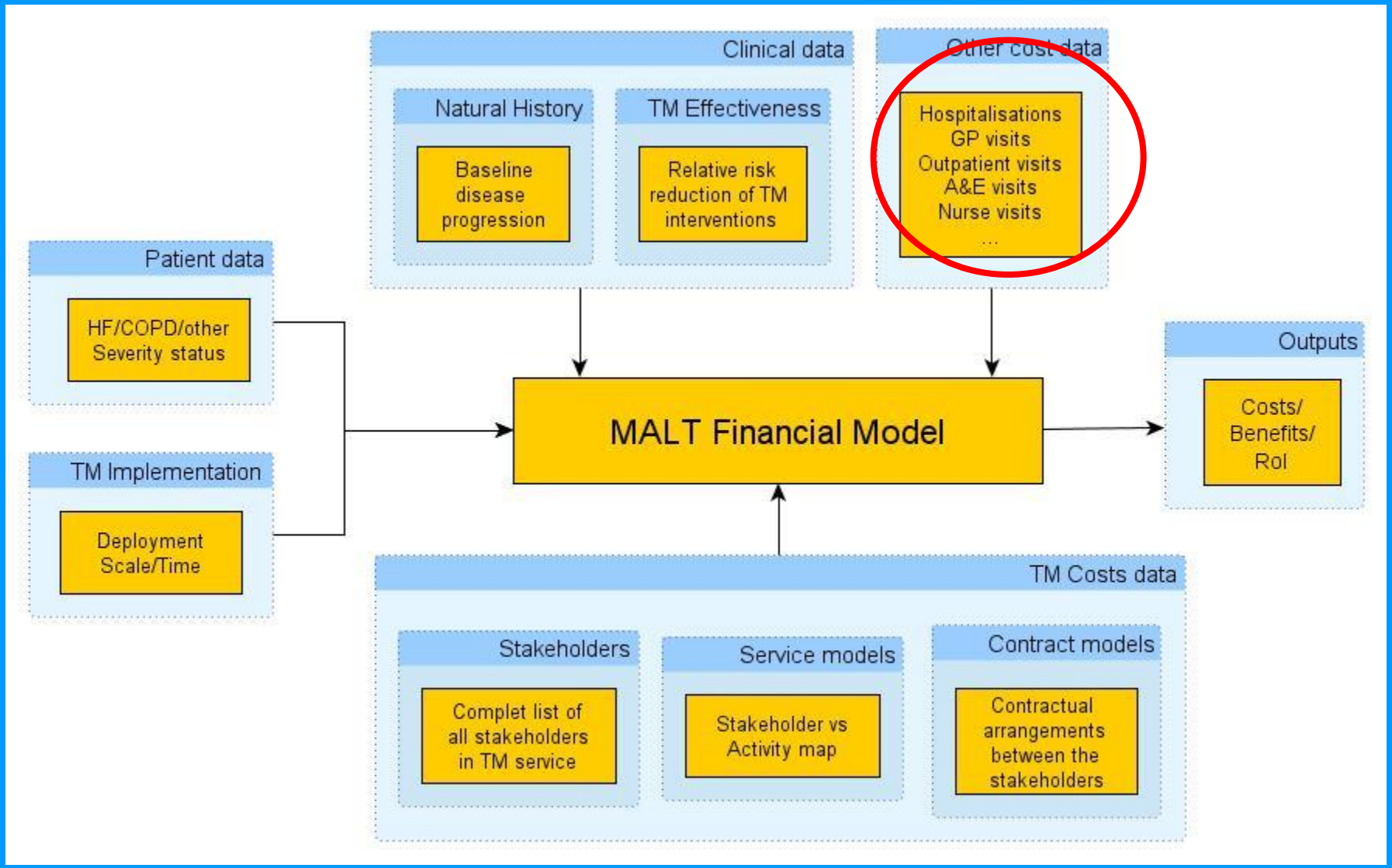
Resource use & other cost data



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Frequency of resource use

	HF A&E visit	Other cause A&E visit	Heart failure hosp	Other cause hosp	Outpatient visits	Visits to GP surgery	Nurse home visits
Severity A	0.020	0.066	0.020	0.086	0.282	0.4928	0.5656
Severity B	0.035	0.088	0.041	0.111	0.367	0.5833	0.4703
Severity C	0.078	0.149	0.105	0.142	0.403	0.5667	0.1857
Severity D	0.253	0.287	0.289	0.225	0.369	0.5586	0.1793

- Data extracted from Hospital Episode Statistics (HES) and MALT patient survey
- Some different between TH and usual care

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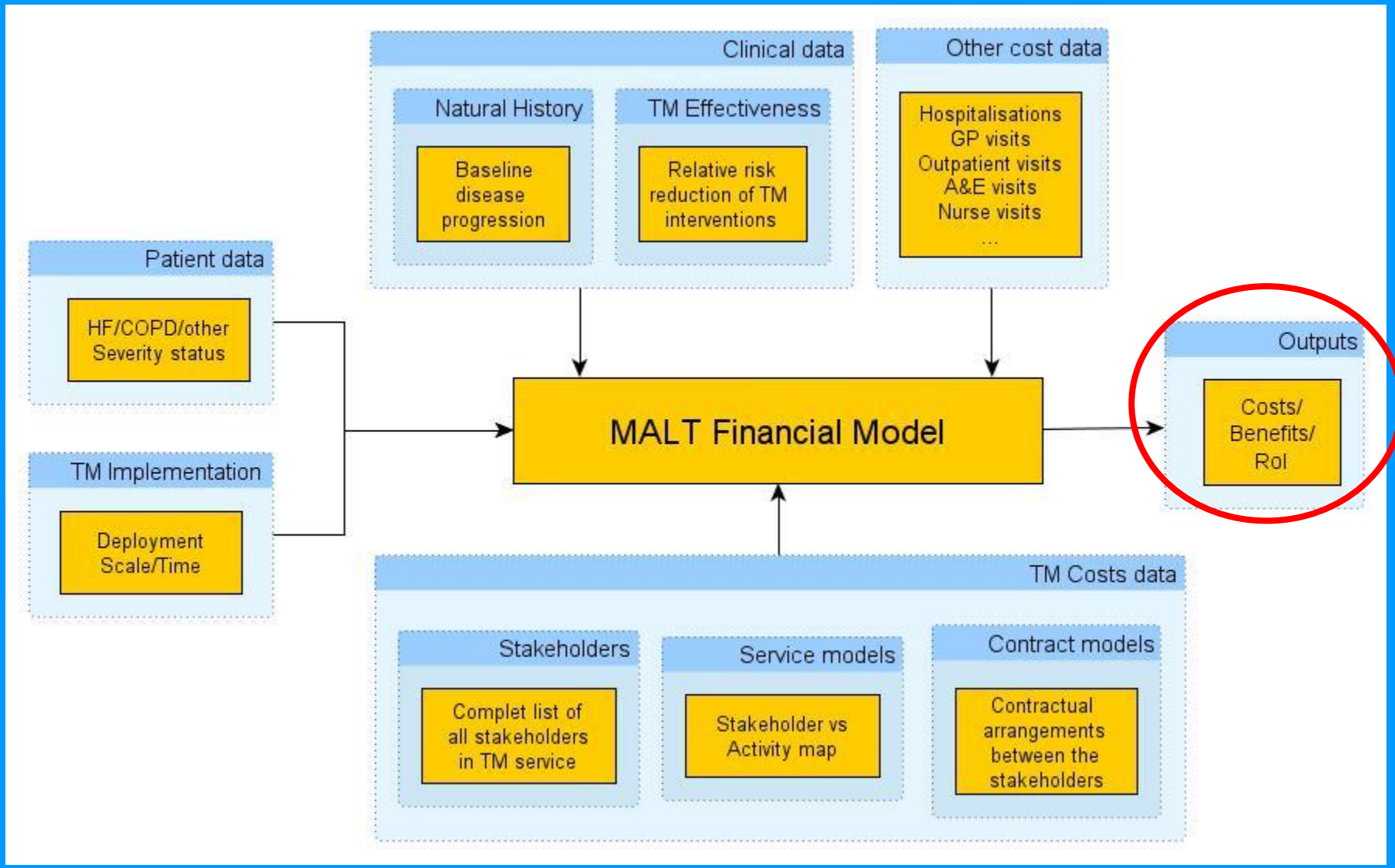
Outputs from the model



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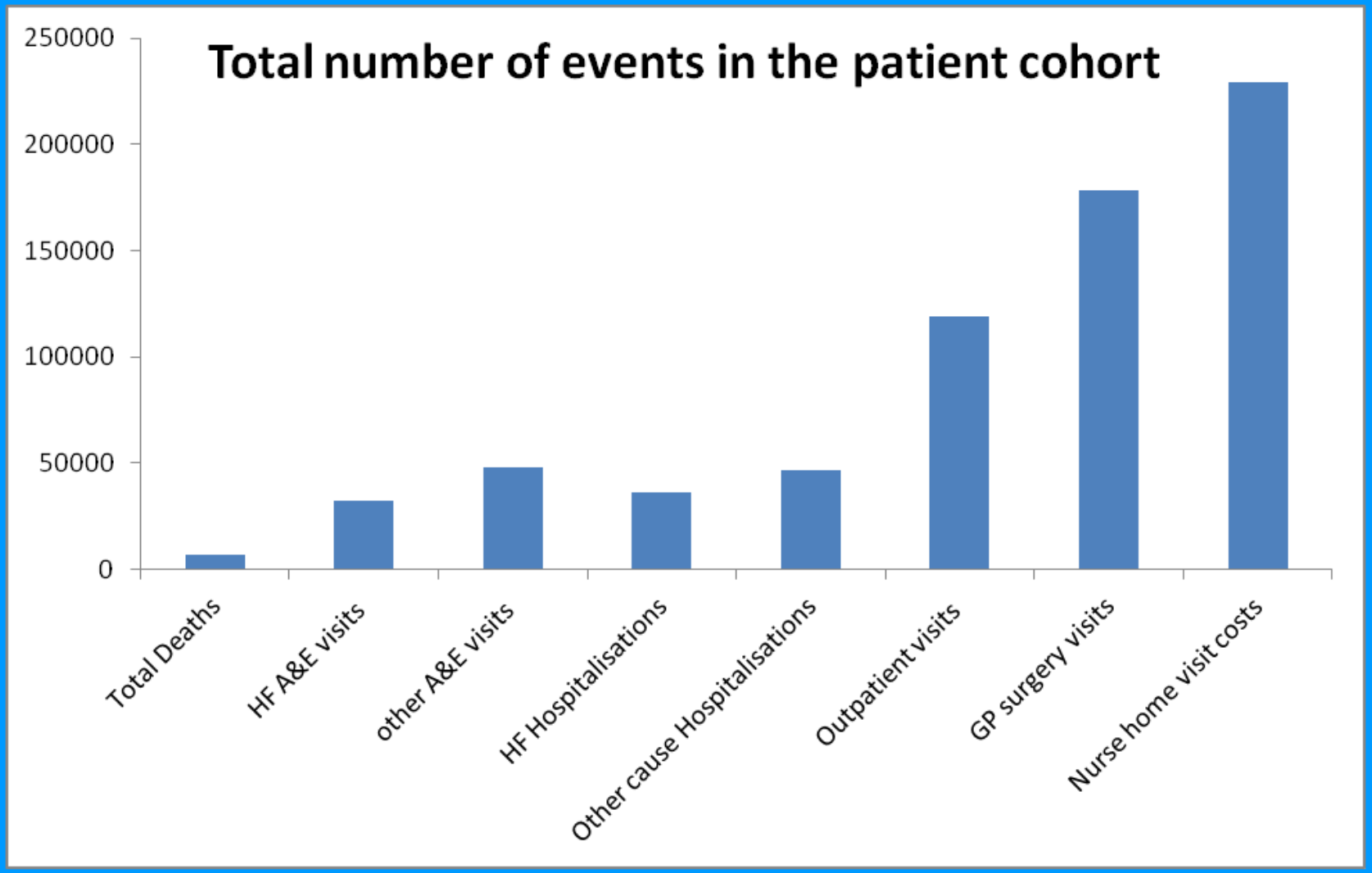
Frequency of events



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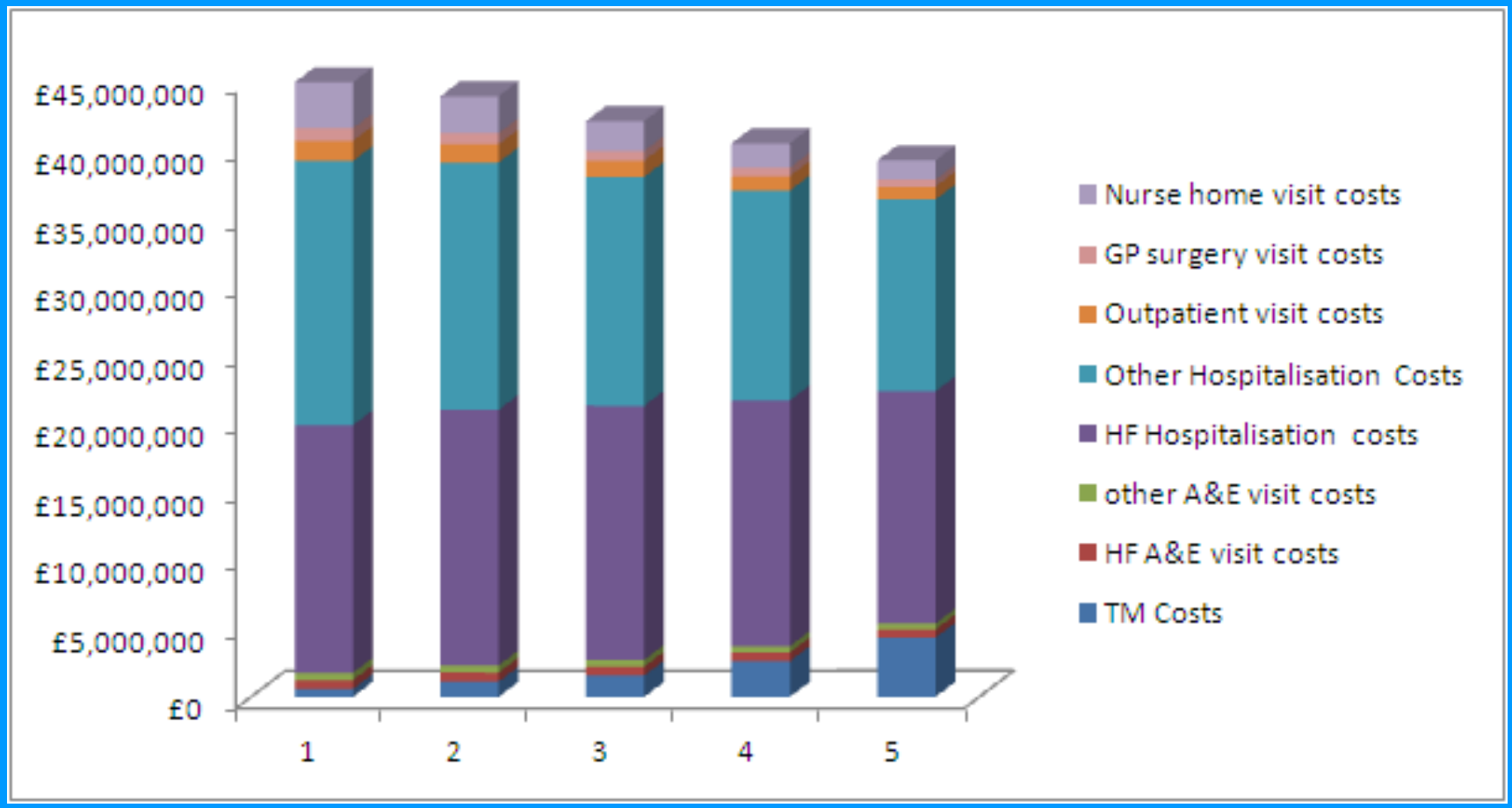
Breakdown of total costs

- Costs breakdown across different years



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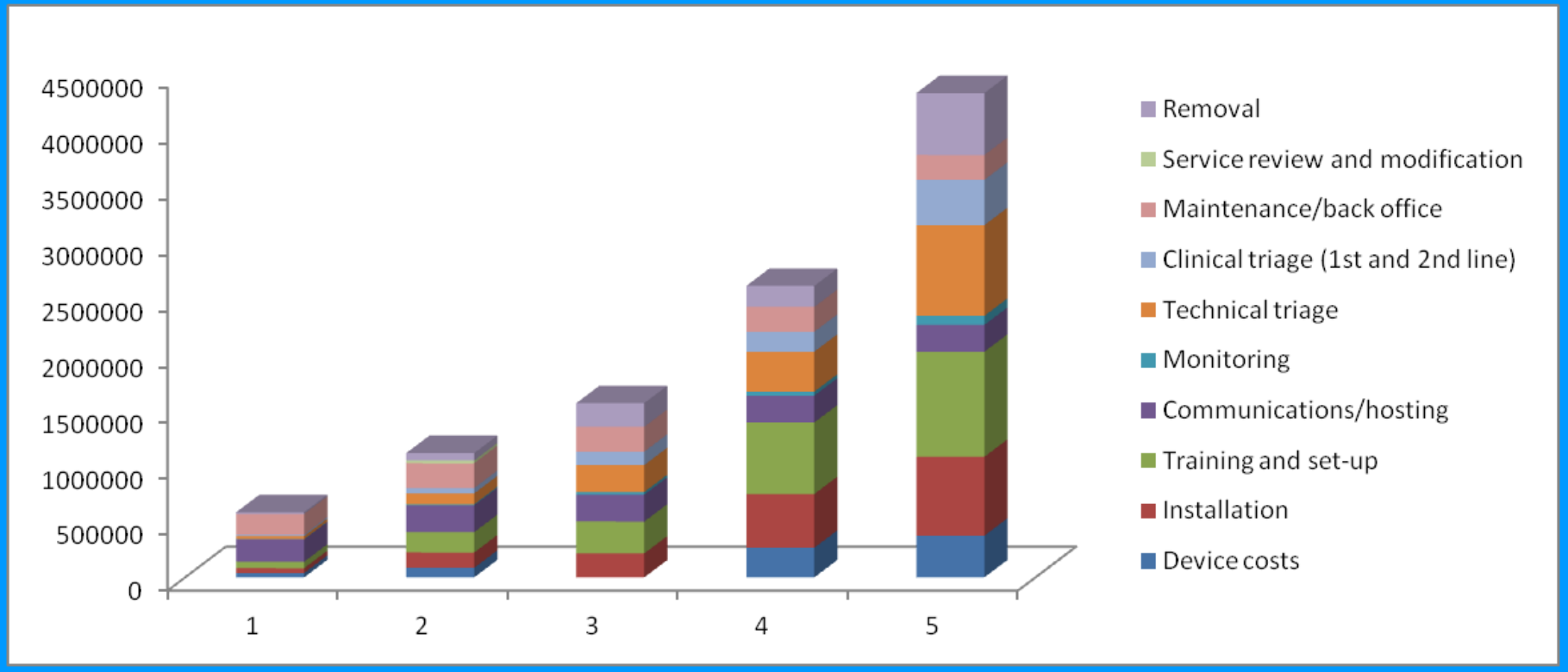
TM costs per activity

- Costs split by different activities across different years (or quarters, months etc)



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Income by stakeholder

- Shows the financial flows between budget holders, can be split across different years

ID	Stakeholder	Received	Paid
1	TH World	£2,343,900	
2	Wyke 6th Form College	£2,107,200	
3	Trumpton	£2,233,000	
4	Harmony	£153,424	
5	Dell	£1,534,244	
6	Trumpton	£767,122	
7	Camberwick Green	£25,000	
8	British Gas	£1,034,880	
9	Pseudomized CCG		£10,198,770

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Case study – 2 scenarios

- Detailed overview at Interactive cafe style session
- Developed two hypothetical telehealth service scenarios (with help of Huw Jones) with slightly different deployment plans and dropout rates
- Aim to compare each other and against having no telehealth (assuming their effectiveness is equal)
- Broadly speaking, one scenario contracts a fully managed service (i.e. one organisation does everything - monthly fee) and other scenario uses separate contractual arrangements with different stakeholders based on costs per patient

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Clinical benefits

	No Telehealth	Scenario 1	Difference (vs no TH)	Scenario 2	Difference (vs no TH)
Total Deaths	6831	6738	-94	6731	-100
HF A&E visits	31852	32076	224	32243	390
other A&E visits	47748	48258	510	48517	769
HF Hospitalisation	35913	36157	244	36341	427
Other cause Hospitalisation	46011	46422	411	46632	620
Outpatient visits	118534	119291	757	119682	1148
GP surgery visits	182936	178647	-4288	177842	-5094
Nurse home visit costs	232695	229207	-3488	228518	-4177
Total QALYs	8973	9023	50	9048	75

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Cost outputs

	No Telehealth	Scenario 1	Difference (vs no TH)	Scenario 2	Difference (vs no TH)
TM Costs	£0	£11,239,120	£11,239,120	£10,198,770	£10,198,770
HF A&E visit costs	£3,185,225	£3,224,260	£39,035	£3,207,585	£22,360
other A&E visit costs	£2,387,415	£2,425,866	£38,452	£2,412,891	£25,476
HF Hospitalisation costs	£89,783,747	£90,852,194	£1,068,447	£90,393,177	£609,430
Other Hospitalisation Costs	£82,820,327	£83,937,212	£1,116,885	£83,559,641	£739,314
Outpatient visit costs	£5,926,695	£5,984,078	£57,383	£5,964,555	£37,860
GP surgery visit costs	£3,658,715	£3,556,835	-£101,881	£3,572,946	-£85,769
Nurse home visit costs	£11,634,734	£11,425,889	-£208,845	£11,460,327	-£174,406
Total Costs	£199,396,857	£212,645,453	£13,248,596	£210,769,892	£11,373,035

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Comparing TH costs

ID	Stakeholder	Received	Paid
1	TH World	£651,600	
2	Overall	£10,587,520	
3	Acorn		£11,239,120

ID	Stakeholder	Received	Paid
1	TH World	£2,343,900	
2	Wyke 6th Form College	£2,107,200	
3	Trumpton	£2,233,000	
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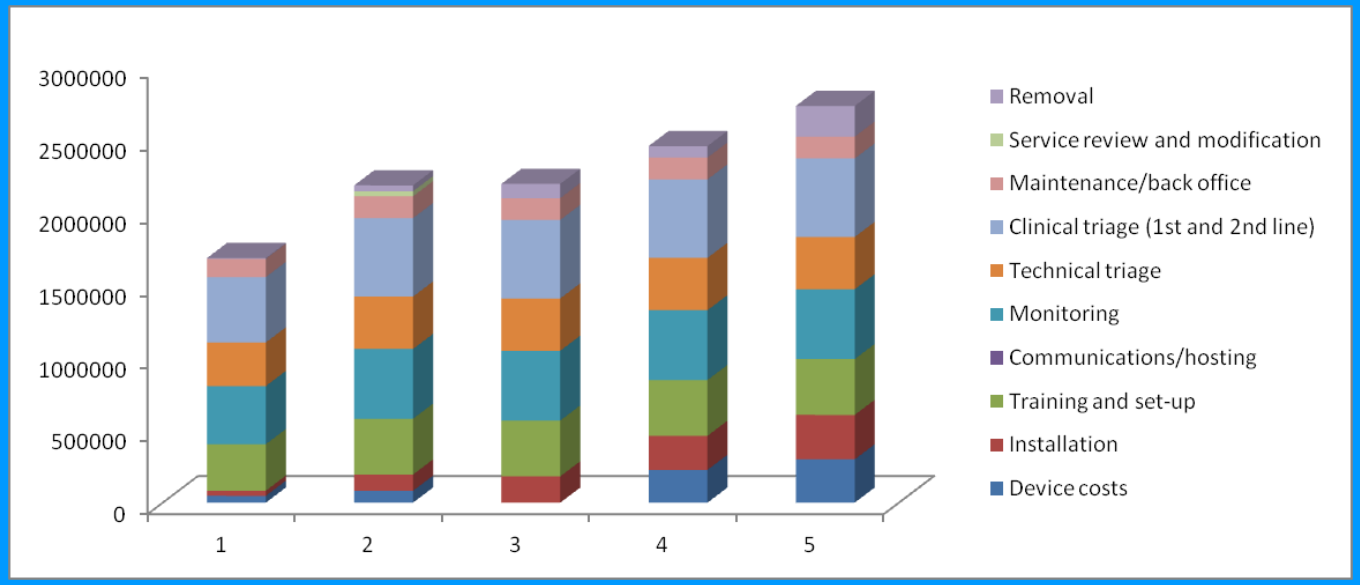
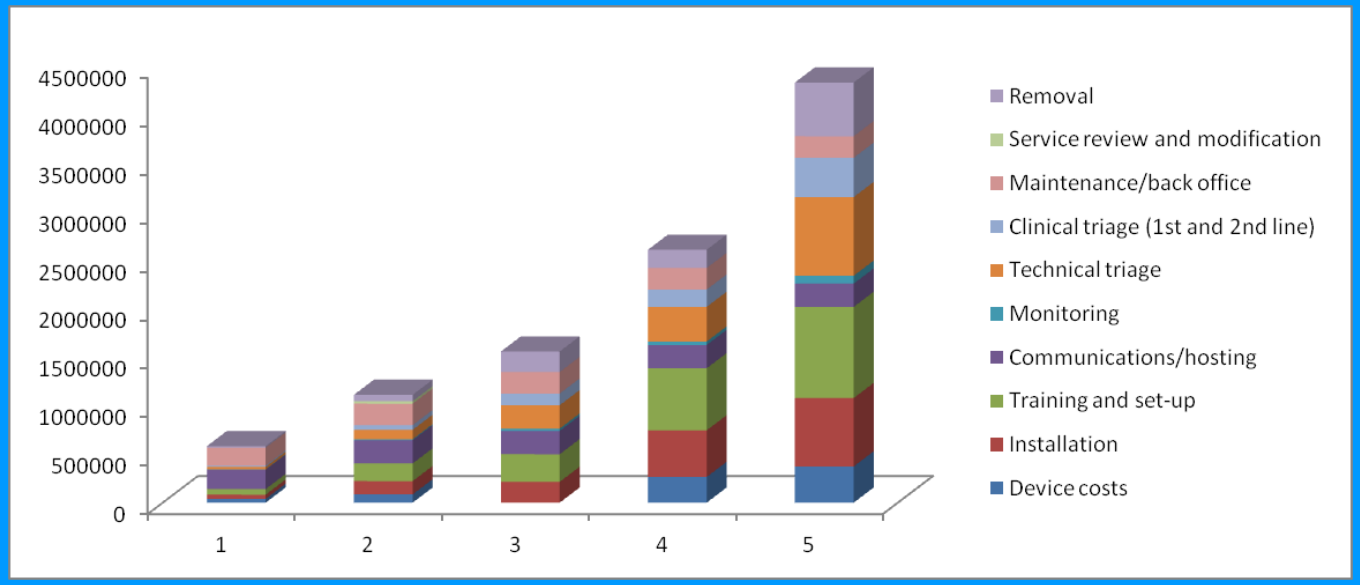
Comparing TH costs

Compare TH costs over time, useful for identifying the areas of difference to choose the appropriate TH scenario





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What can the model do?

- Our economic model can provide:
  - A picture of whole system in terms of costs and patient outcomes – where are we now?
  - A framework to facilitate option generation – which parameters are important?
  - A tool to examine scenarios – what can we expect to happen?
  - A platform to facilitate discussions between stakeholders – identify tensions and win-wins
  - A framework for evaluation – what data do we need to collect to see if it worked?

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What next? - MALT sites

1. Interviews to identify requirements of an economic model
2. Development of economic model
3. Populate model with current costs, volumes and outcomes
4. Develop scenarios that represent current plans and alternative deployments if things don't go to plan
5. Generate predictions for scenarios and produce short report
6. Hand model over so that it can be used as a planning tool
7. Check/amend predictions each quarter (for three quarters)
8. Collect user experience of the model
9. Final report – evaluation of the model and user experience
10. Publish model

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Some thoughts…

- A model without good data is useless. Some data can not be gathered from HES or the literature, so data needs to be input by the users
- A model with data, but without a real world application is almost useless. We don't want to develop this within an academic bubble and risk it being irrelevant or wrong
- We fully expect services to highlight inadequacies with the model (which we will fix)
- At the end of the project, the final model will be made available to all and so we need user feedback in advance of that – Interactive cafe style session

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Any Questions?

