Economic Impact of Wait Times in Healthcare Service

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Outline

- Importance
- Objectives
- Data Collection
- Model Development
- Results
- Discussion
- Contribution / Recommendations
- Ongoing Related Work

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Canadians' Top Public Policy Concerns

Health care	66%
Post-Secondary Education	46%
Cut Middle-class Taxes	45%
Reduce Federal Debt	39%
National Childcare Program	39%
Environment	34%

Source: Ipsos Reid/G&M/CTV Poll

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Importance of Wait Times Public's Perspective

- Desire for change in the delivery of health care – 65%
- Growing acceptance that our current system is not sustainable
- Chaoulli Decision - 60% think the ruling will lead to shorter wait lists in their province

Source: Ipsos Reid/G&M/CTV Poll

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Importance of Wait Times Patients' Perspective

Psychology of Waiting *(HBR, Maister 1995)*

- Anxiety makes waits seem longer.
- Pre-process waits feel longer than in-process waits.

Economic Cost

- Direct costs
  - Equipment, hospital stay, homecare, etc.
- Indirect costs
  - Loss of time from work, loss of time from school, etc.

Importance of Wait Times Government Perspective

- Federal Government
  - Wait Time Guarantee
    - » Aboriginal Diabetes Plan
    - » Paediatric Surgery Guarantee
  - Minority government
- Provincial Governments
  - United in requests of the Federal government
    - » Health care fiscal escalator established by the Liberal government
  - Fiscal capacity of each determines the approach to wait times in their jurisdictions

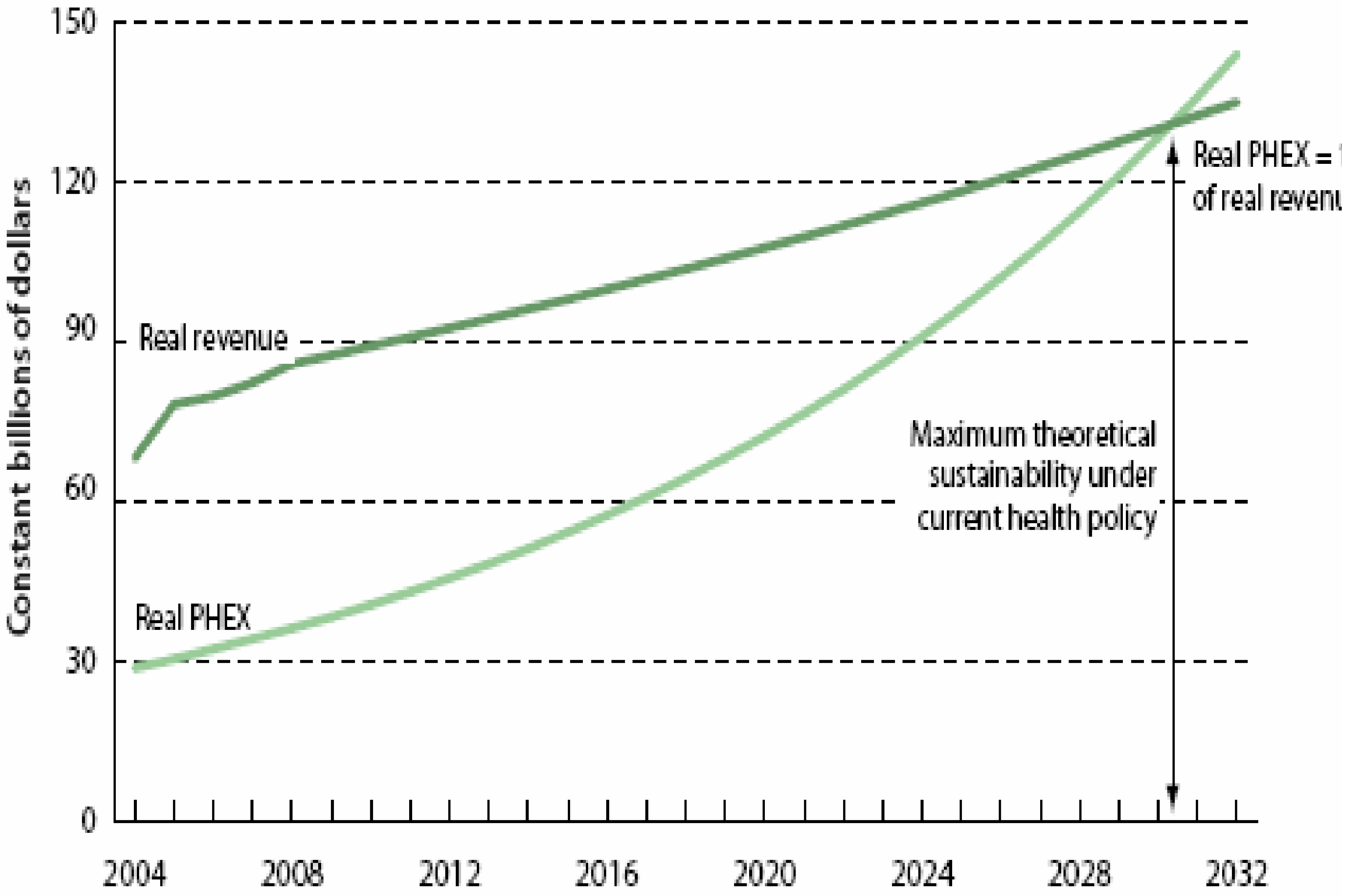
Real Cost Pressures on the System

- New Technologies
- Demographic Changes
- Critical funding challenges for teaching hospitals
- Notion that governments can simply continue to pay more and more is unworkable

Importance of Wait Times Economic Perspective

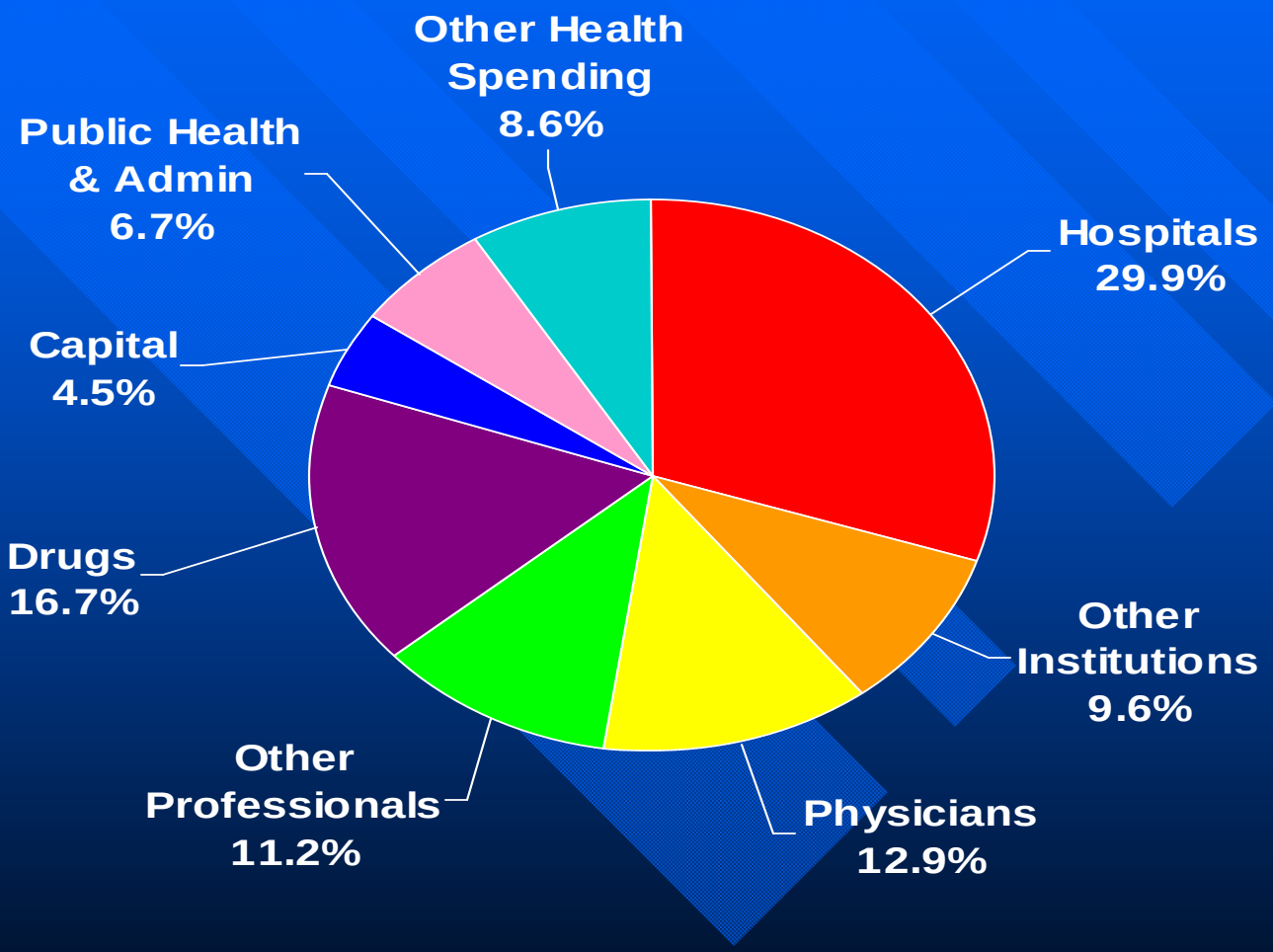
- Healthcare consumes an increasing percentage of our economic product
  - 47% of the Ontario Budget
- Cost
  - Aging population
  - Research & development
  - **Healthcare delivery**

Figure 3: Projected real growth in provincial health expenditures (PHEX) and total provincial revenues from all sources in Ontario, 2004/05–2031/32

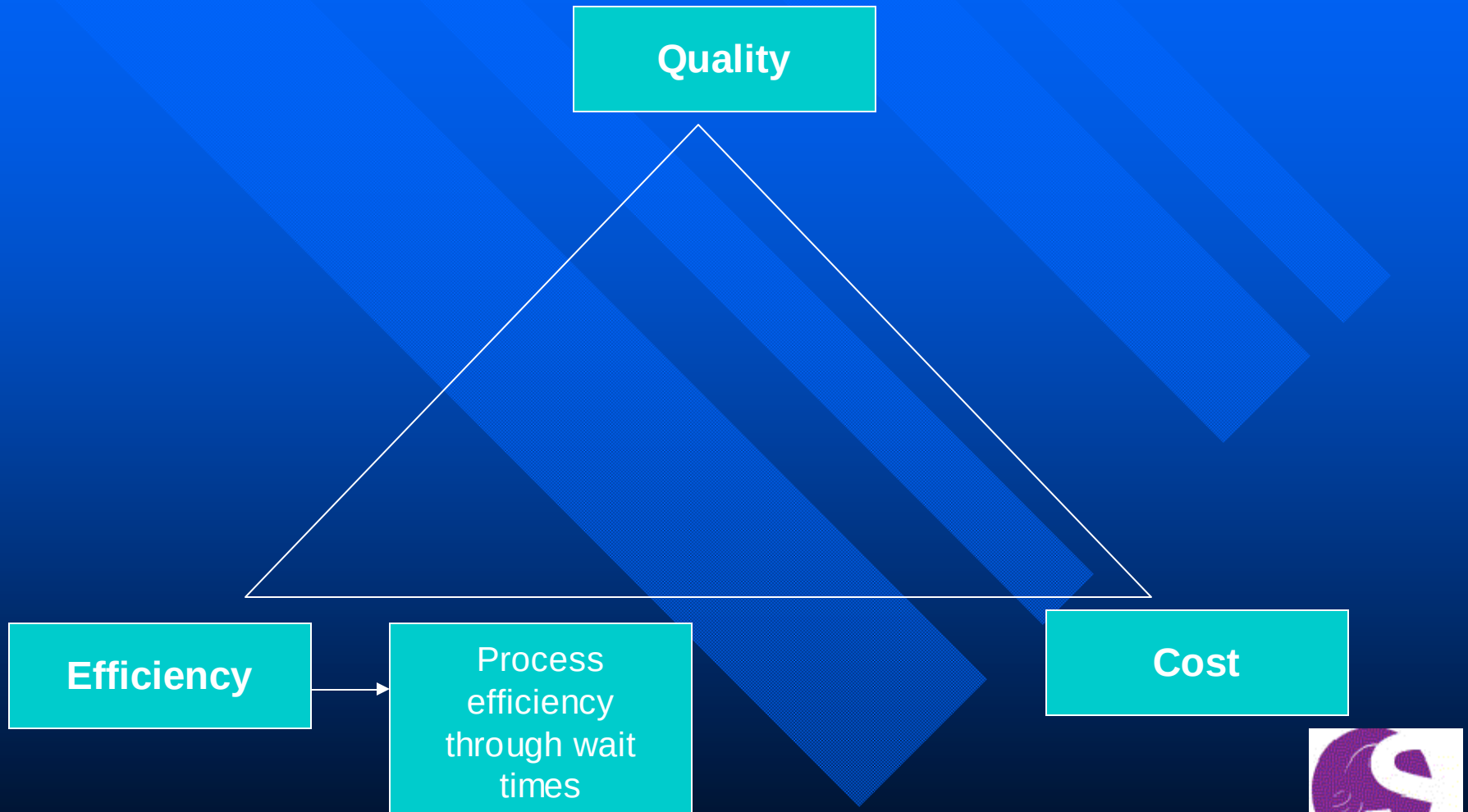


Total Health Expenditures Canada

Current Dollars Percent Distribution



Healthcare Delivery



Objectives

- To identify inefficiencies in the patient flow
- To conduct a sensitivity analysis
- To re-design the process to reduce wait times
- Identify process costs to the system

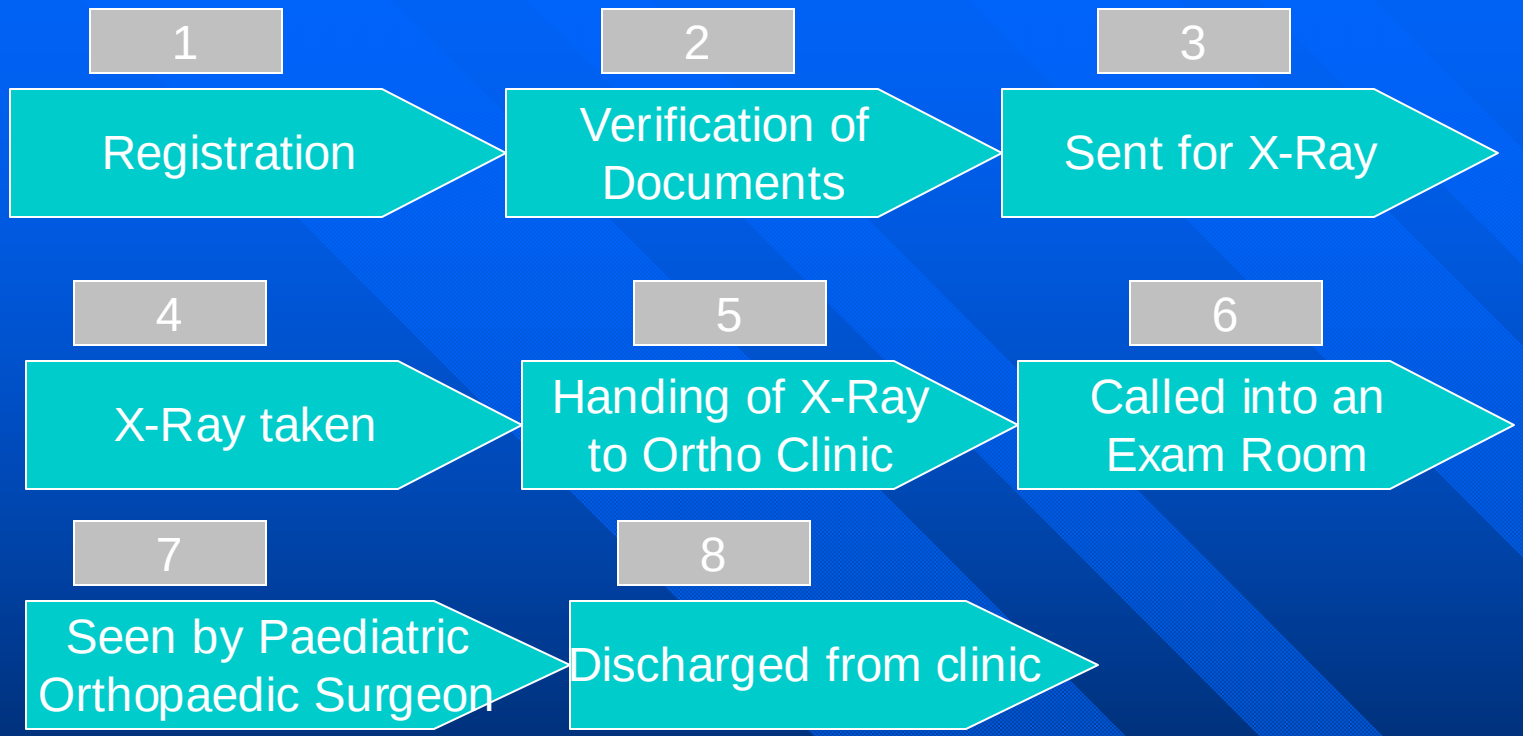
Data Collection

- Survey
  - Paediatric Orthopaedics Clinics
  - Questionnaire - Validated
    - » Objective time and motion study
  - 500 surveys collected – over two time periods
- Time Periods
  - December 2003 - February 2004
  - December 2006 - February 2007
  - 10 weekly sessions each

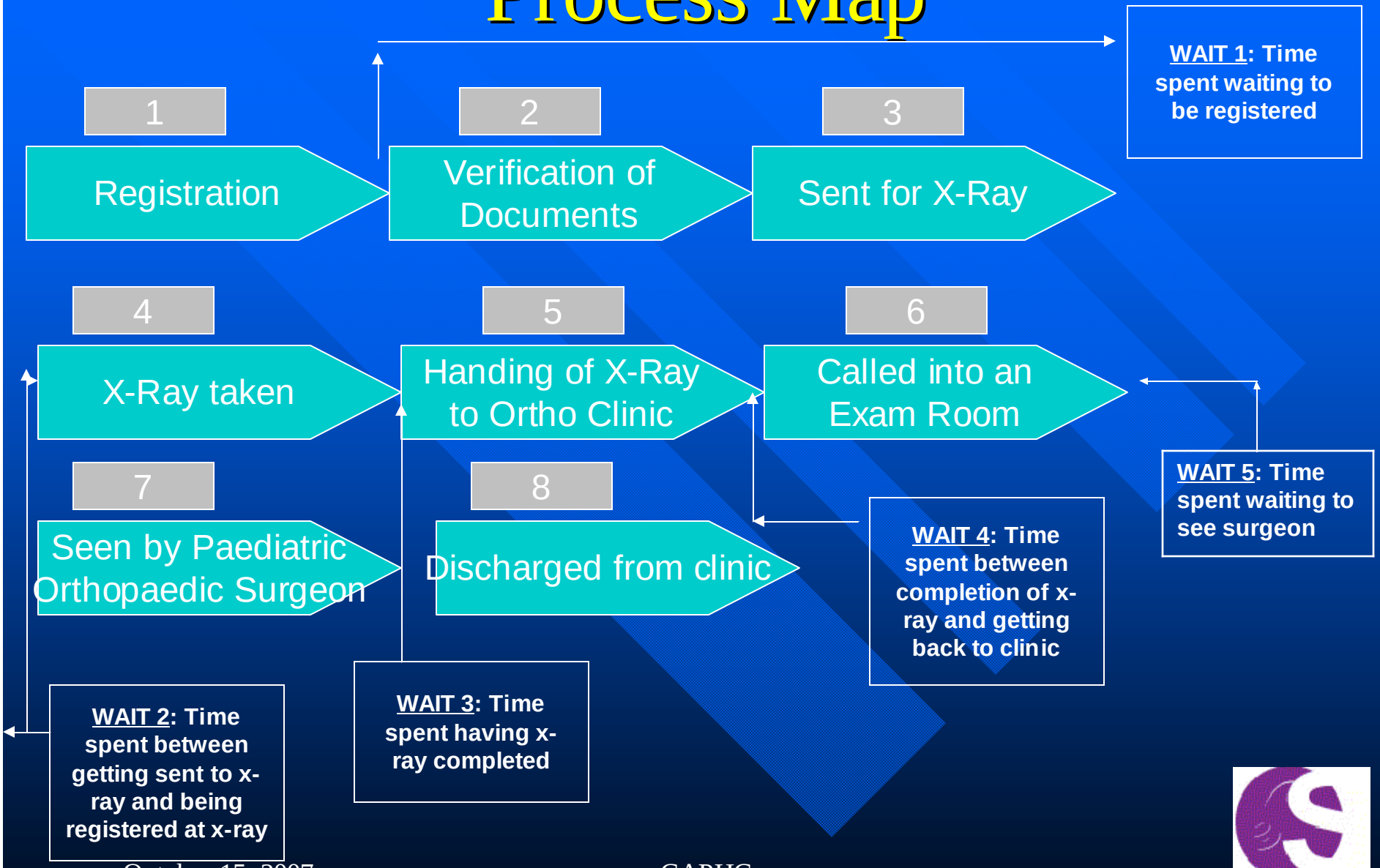
Process Modeling

- To ascertain how patients are currently served
- To determine where efficiencies can be improved and to prioritize changes.
- Reveal unnecessary repetition, miscommunication, and inconsistency in methods.

Process Map


1
Registration
2
Verification of Documents
3
Sent for X-Ray
4
X-Ray taken
5
Handing of X-Ray to Ortho Clinic
6
Called into an Exam Room
7
Seen by Paediatric Orthopaedic Surgeon
8
Discharged from clinic

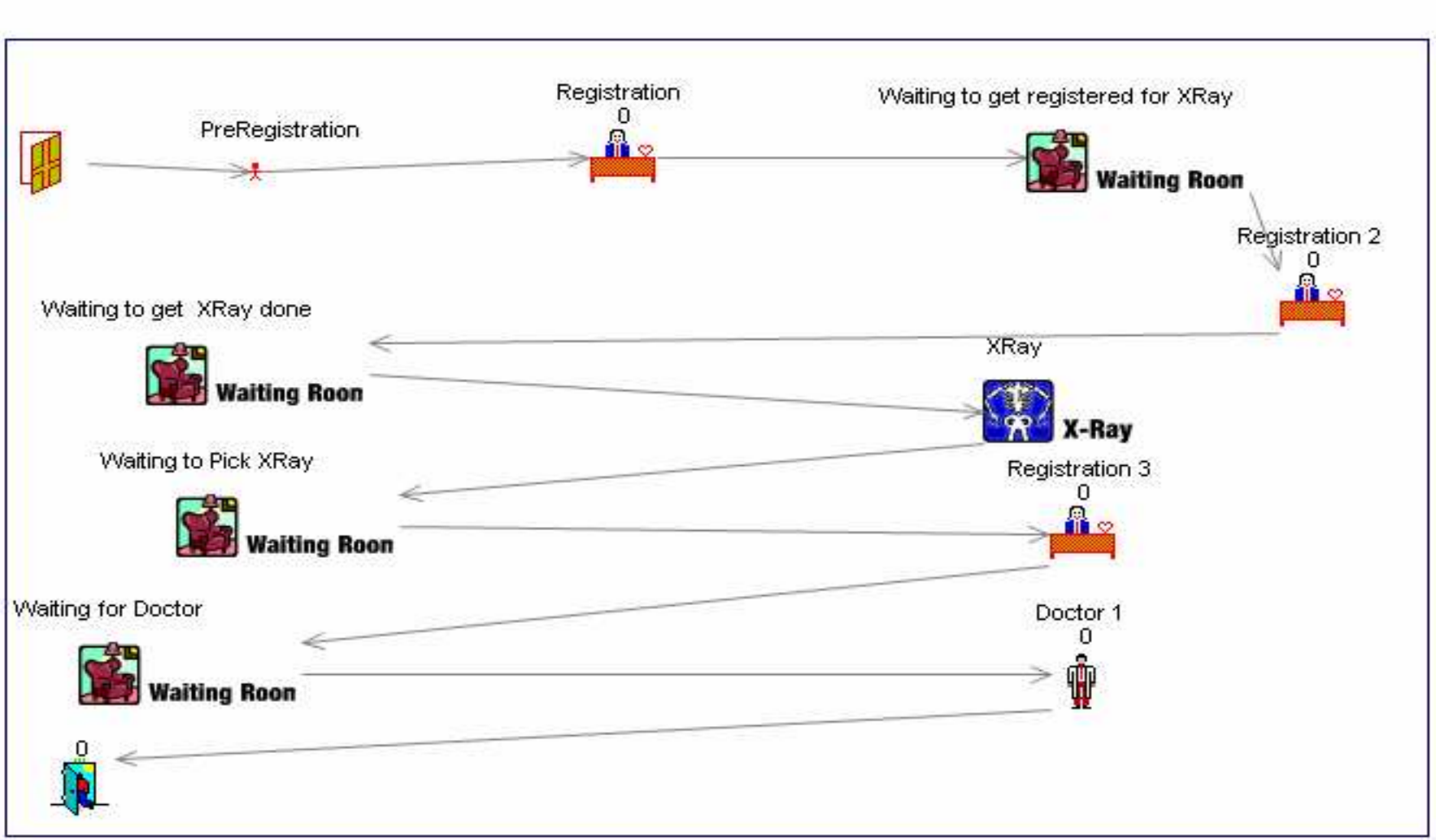
Process Map


1
Registration
2
Verification of Documents
3
Sent for X-Ray
WAIT 1: Time spent waiting to be registered
4
X-Ray taken
5
Handing of X-Ray to Ortho Clinic
6
Called into an Exam Room
WAIT 5: Time spent waiting to see surgeon
7
Seen by Paediatric Orthopaedic Surgeon
8
Discharged from clinic
WAIT 4: Time spent between completion of x-ray and getting back to clinic
WAIT 2: Time spent between getting sent to x-ray and being registered at x-ray
WAIT 3: Time spent having x-ray completed

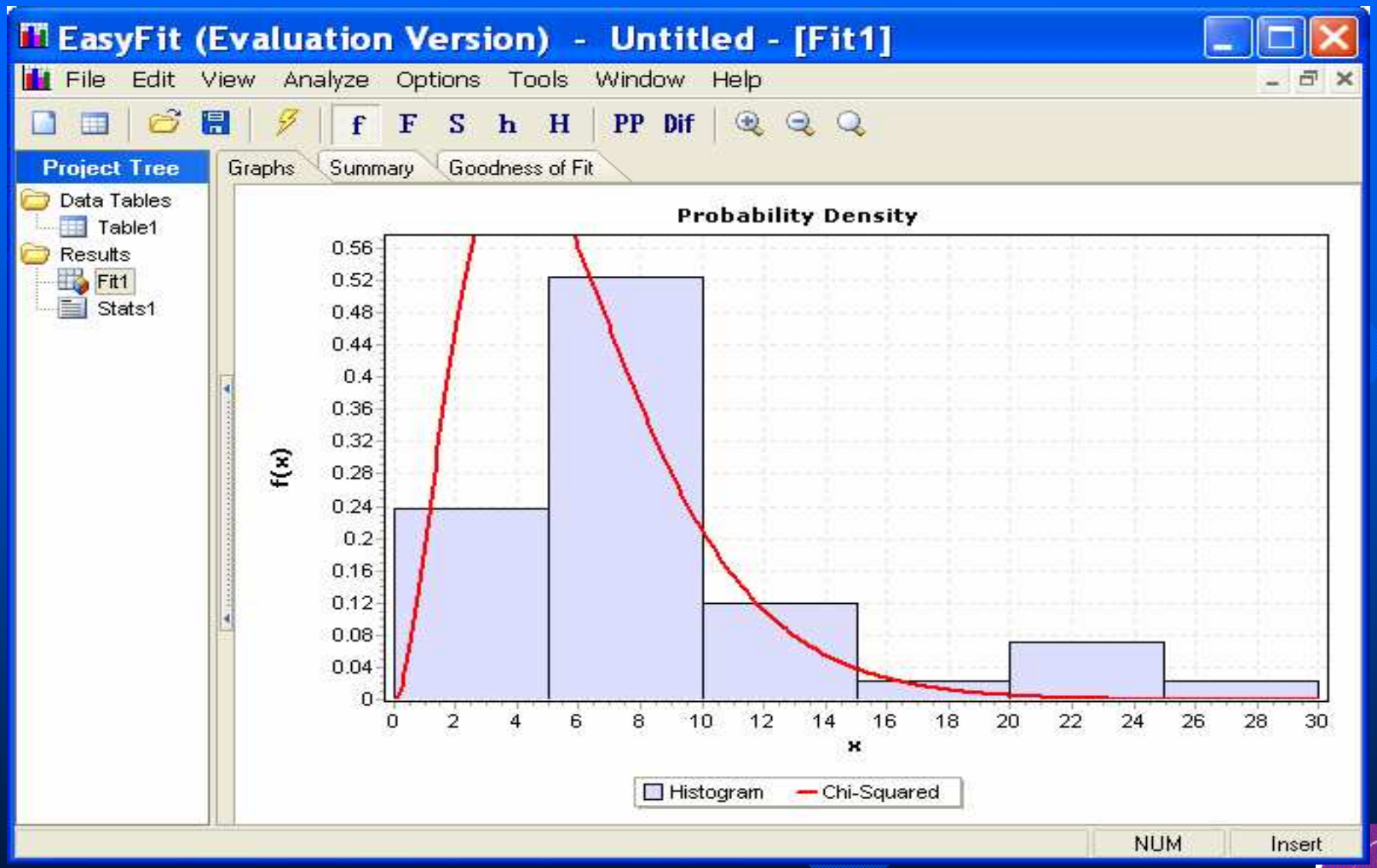
Simulation Model

- Simulate Process Map
  - Analysis of patient flow
- Data collection for each step in the process
- Run the Model
- Verify and Validate the model
  - Completed 10 times for each data set
- Change configuration and test changes
- Result Analysis

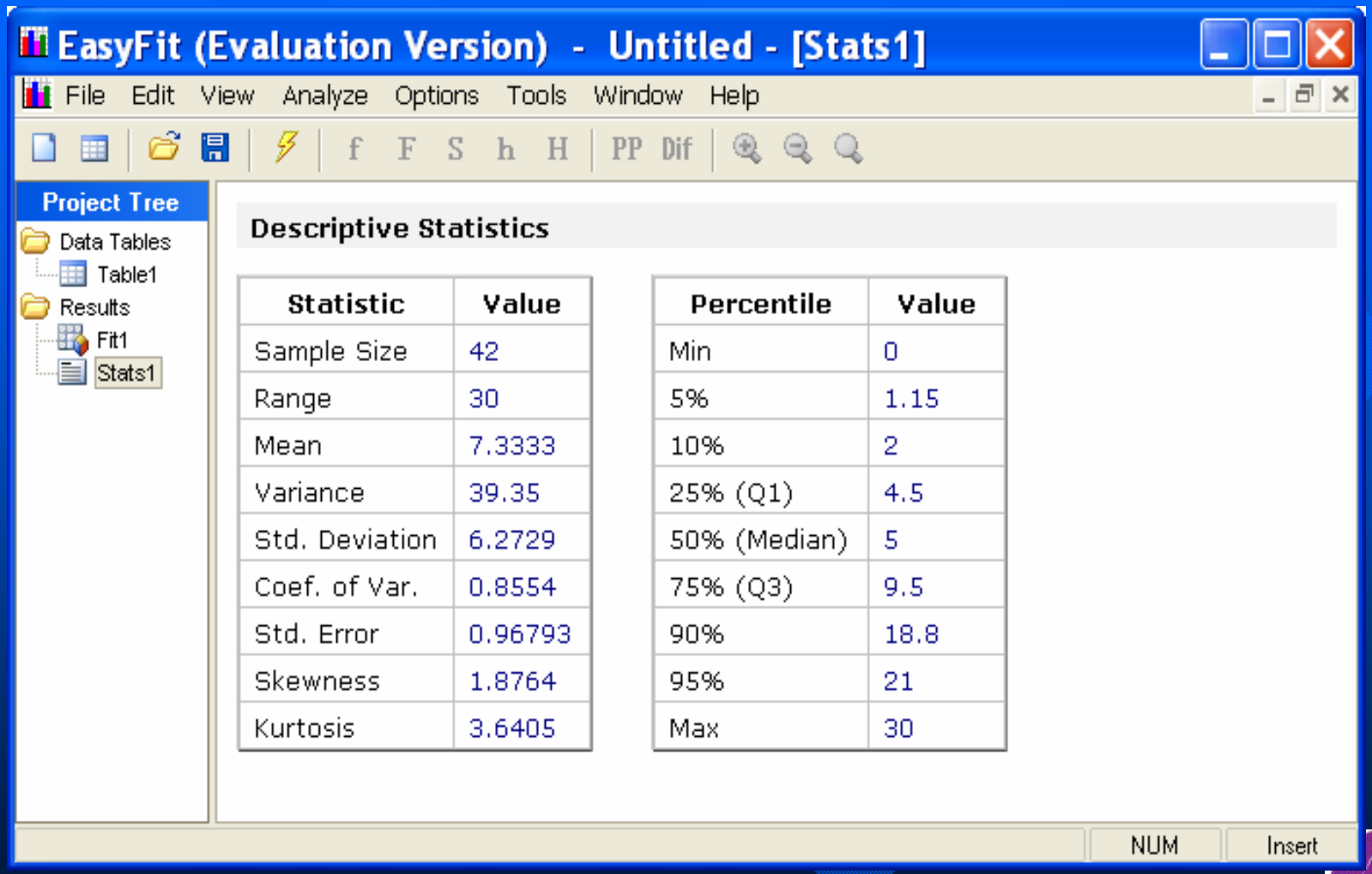
Simulation Model for Patients Process



Wait 1: Arrival Process



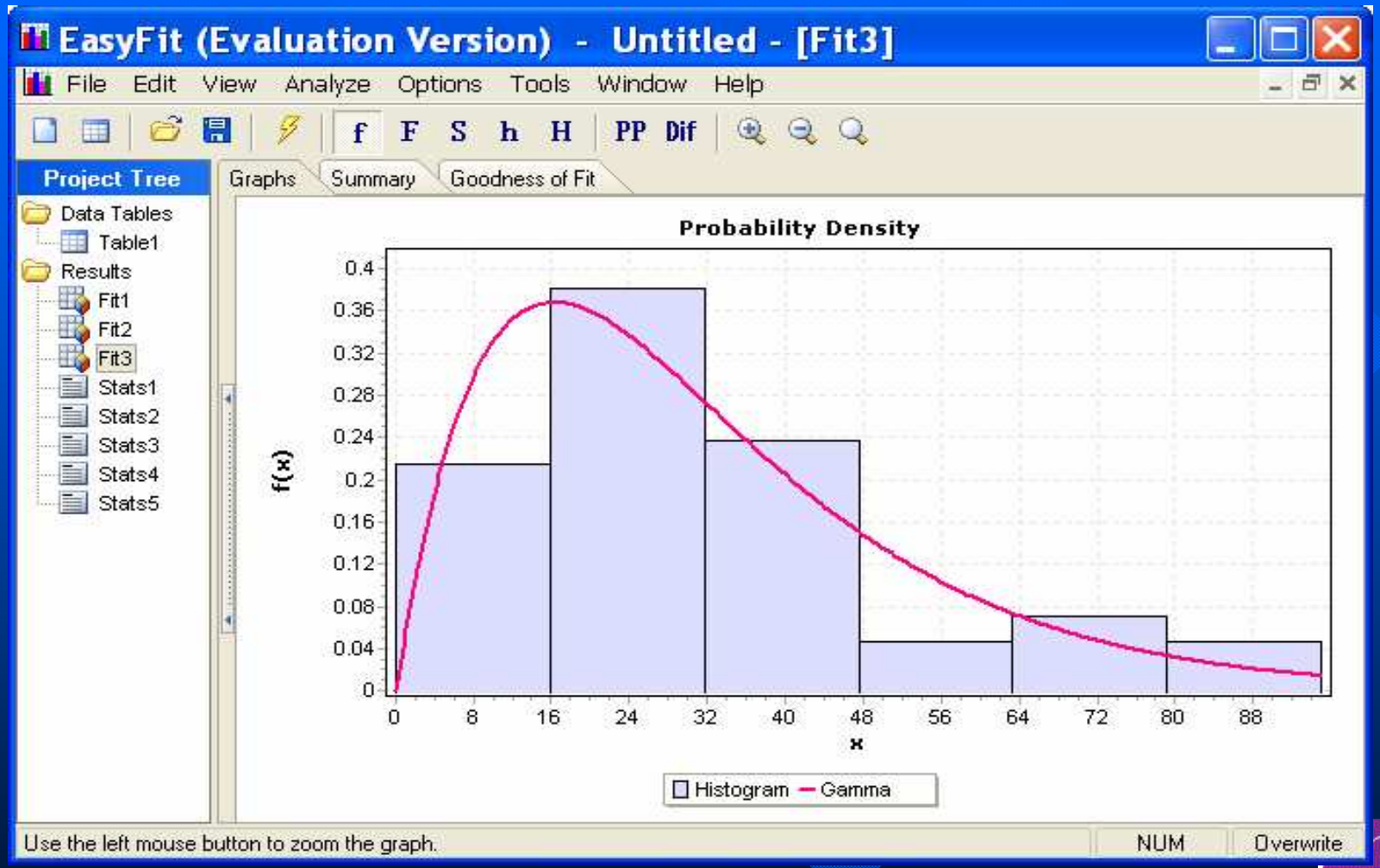
Wait 1: Arrival Process



Statistic	Value
Sample Size	42
Range	30
Mean	7.3333
Variance	39.35
Std. Deviation	6.2729
Coef. of Var.	0.8554
Std. Error	0.96793
Skewness	1.8764
Kurtosis	3.6405

Percentile	Value
Min	0
5%	1.15
10%	2
25% (Q1)	4.5
50% (Median)	5
75% (Q3)	9.5
90%	18.8
95%	21
Max	30

Wait 2: X-ray Registration Process



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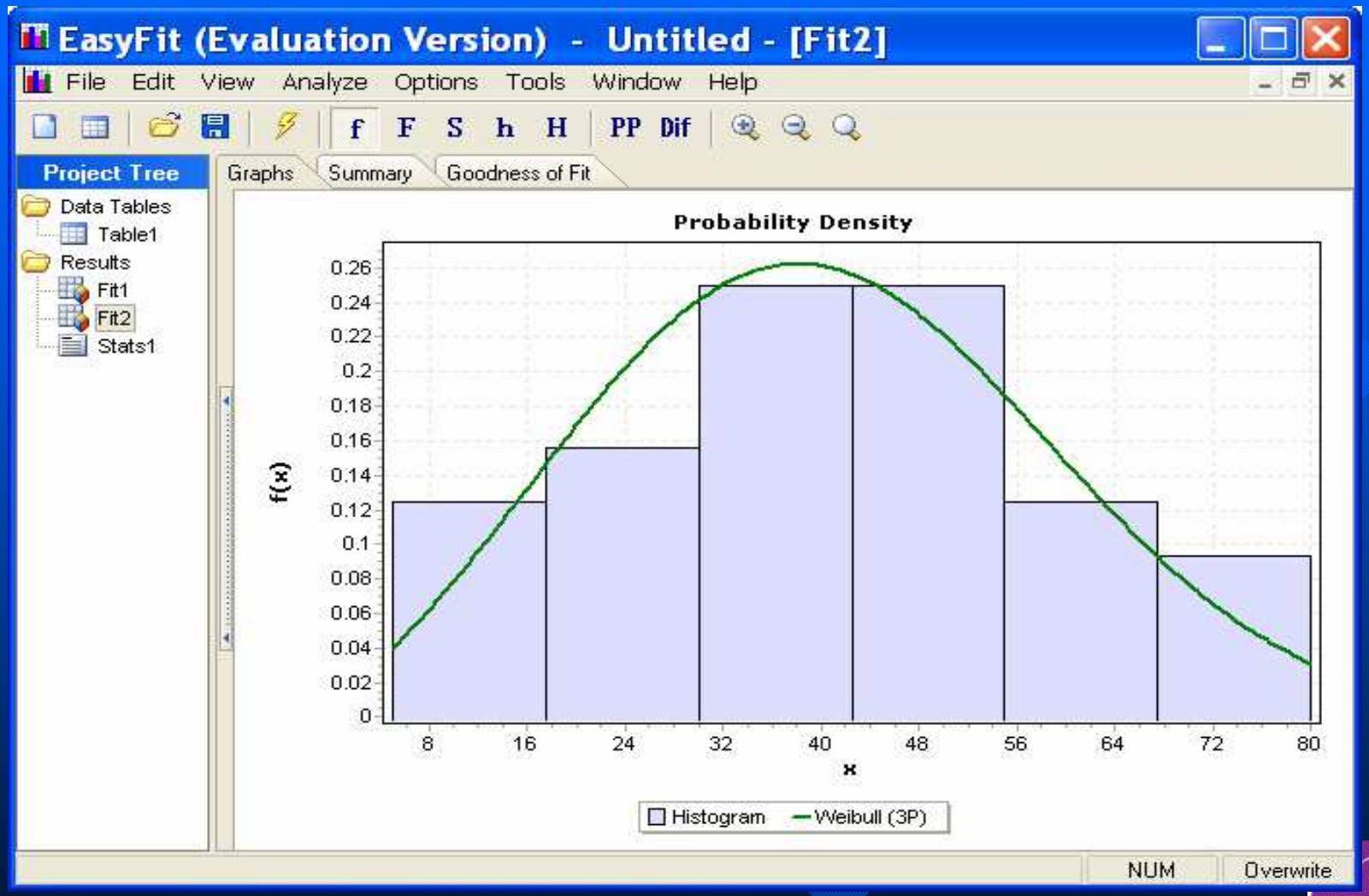
Wait 3a: Wait for X-Ray



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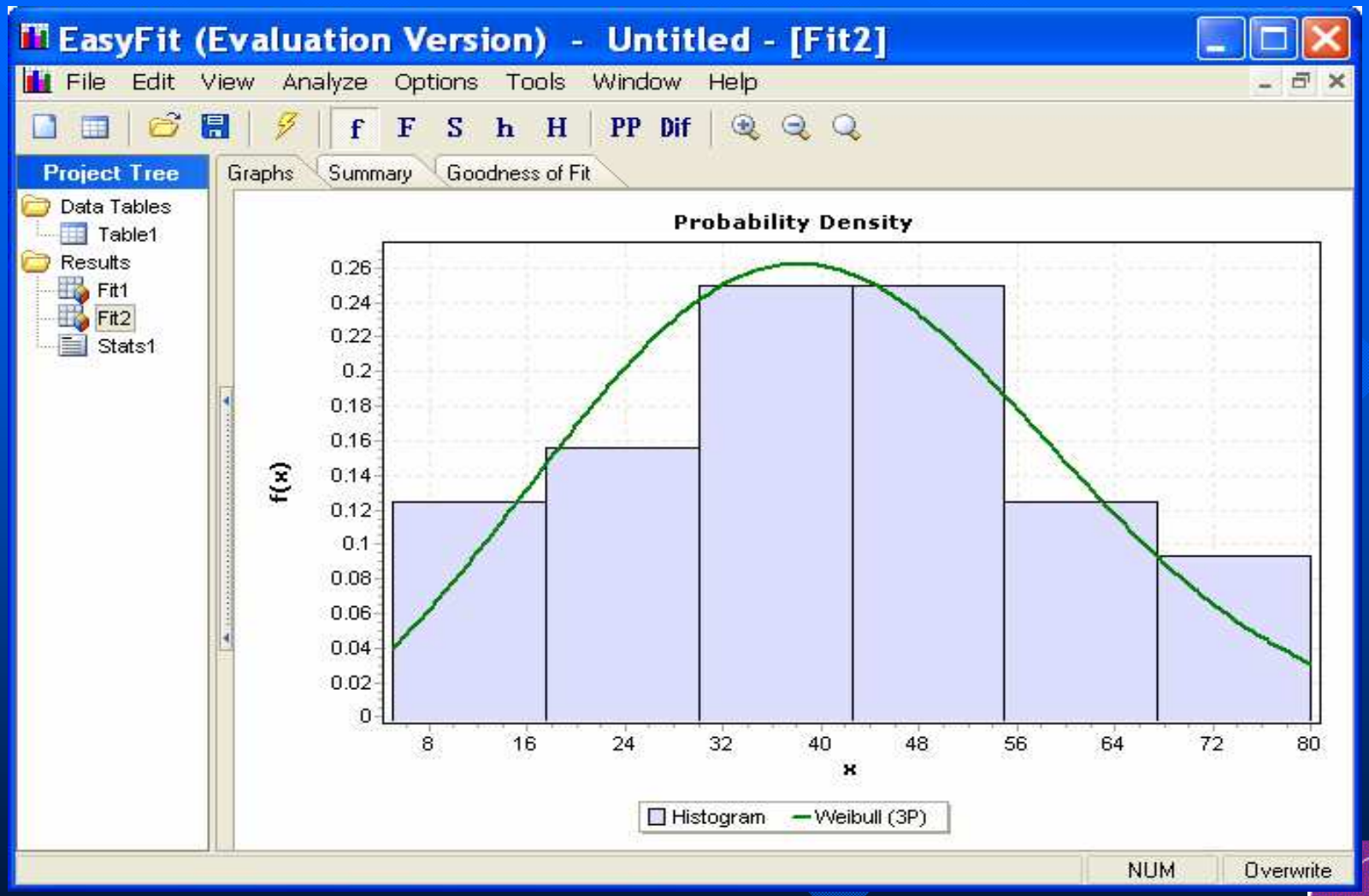
Wait 3b: Wait for X-Ray



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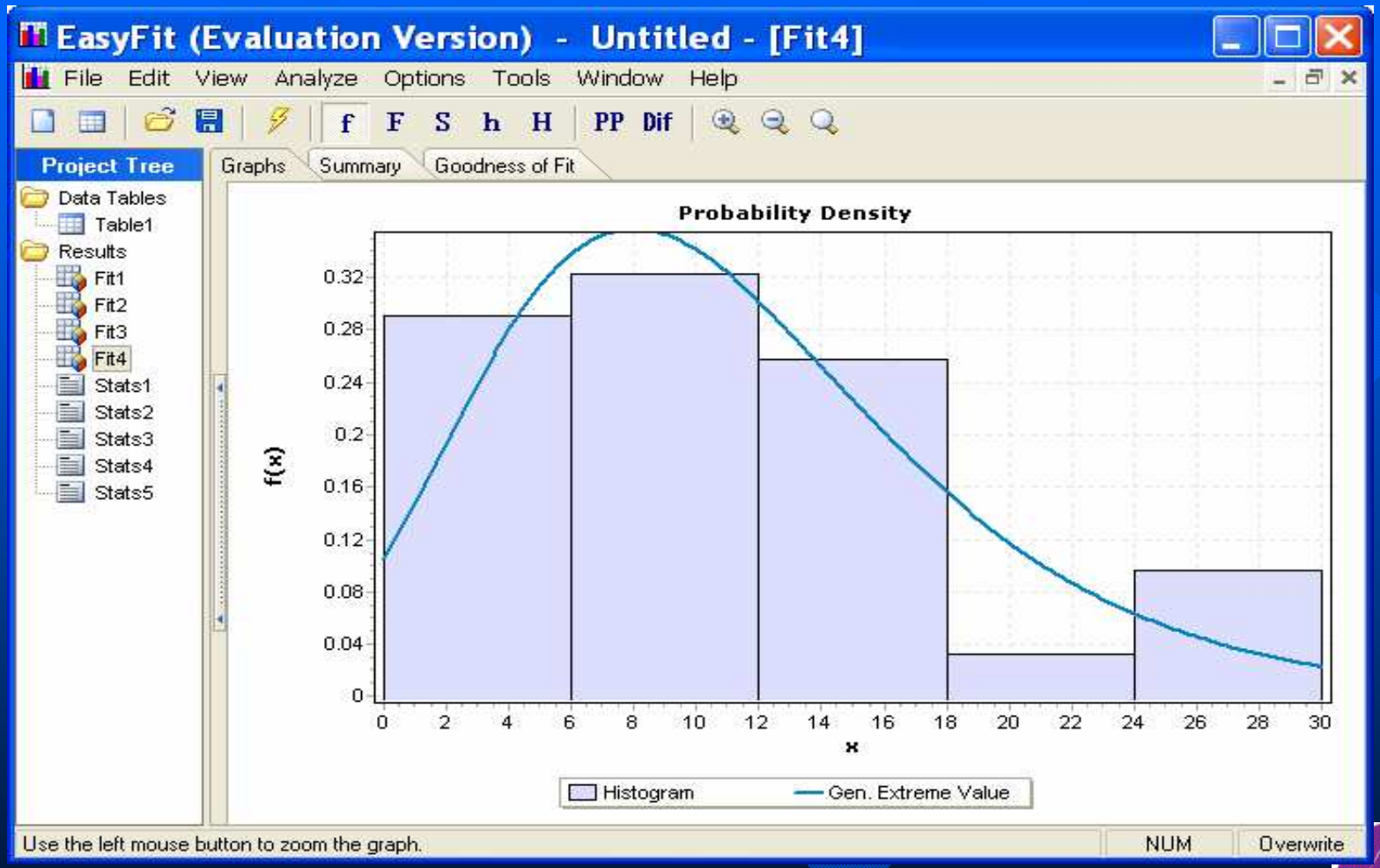
Wait 4: X-Ray to Clinic



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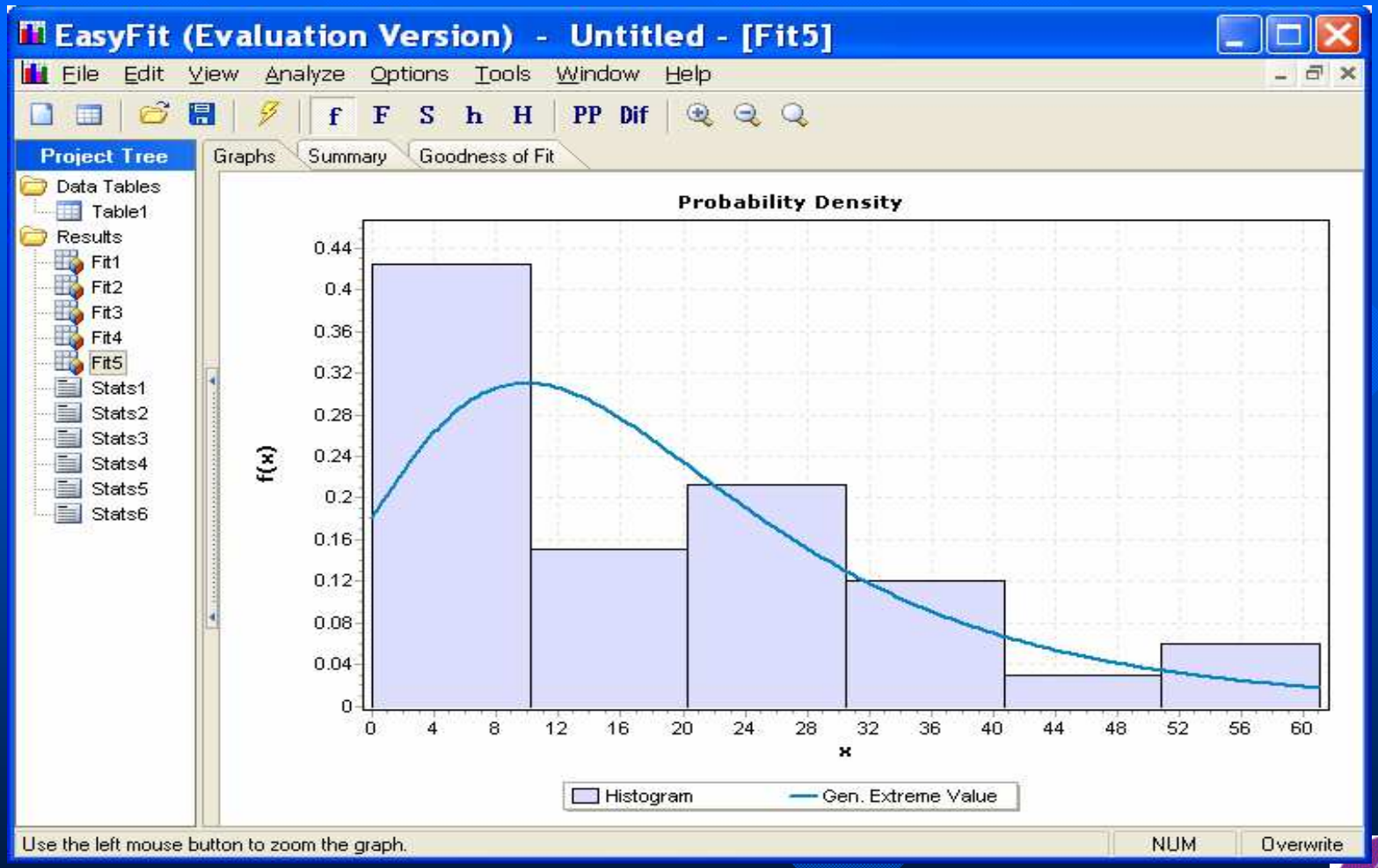
Wait 5: Wait for Examination



Simulation Results

- What do these results allow us to do:
  - Evaluate new processes
  - Understand and demonstrate the current causes of delay.
- How do we utilize this process modeling
  - Sensitivity analysis
  - Economic analysis

Results: Average Processing Times

Run*	Average Time (in minutes)
1	64
2	72
3	92
4	78
5	121
6	76
7	97
8	78
9	114
10	94
Average	88.6

* Every Run incorporates average simulation of 100 discrete clinic visits

Wait 2: Sensitivity Analysis

Base Case		Waiting to be registered for X-ray (11.46 min)
Run*		**Reduce time by 4 minutes**
1	64	88
2	72	77
3	92	80
4	78	92
5	121	90
6	76	78
7	97	73
8	78	82
9	114	76
10	94	80
Average	**88.6**	**81.6**
Difference in Overall Time		**7 minutes ↓**

Despite reduction of wait times in one task, in some cases the processing times will increase. The reason is that wait times reduces in one task may build up queues for the other task. Thus, more attention should be paid to the average processing times.

Every Run incorporates average simulation of 100 discrete clinic visits

Every minute saved at this task saves 1.7 minutes in the whole process for every patient with everything else constant

Wait 3b: Sensitivity Analysis

Base Case		Waiting to get X-ray done (13.78 min) **
Run*		**Reduce time by 5 minutes**
1	64	59
2	72	74
3	92	93
4	78	62
5	121	80
6	76	78
7	97	70
8	78	100
9	114	74
10	94	69
Average	**88.6**	**75.9**
Difference in Overall Time		**12.7 minutes ↓**

Every minute saved at this task saves 2.5 minutes in the whole process for every patient, with everything else constant

**** Previously, a wait for x-ray was 40.59 minutes.**

Wait 4: Sensitivity Analysis

Base Case		Waiting to Pick X-ray (11.46 min)
Run*		**Reduce time by 3 minutes**
1	64	101
2	72	86
3	92	91
4	78	84
5	121	85
6	76	83
7	97	83
8	78	73
9	114	84
10	94	75
Average	**88.6**	**84.5**
Difference in Overall Time		**4 minutes ↓**

Every minute saved at this task saves 1.3 minutes in the whole process for every patient with everything else constant

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Wait 5: Sensitivity Analysis

Base Case		Waiting to See Doctor (37 min)
Run*		**Reduce time by 7 minutes**
1	64	104
2	72	74
3	92	82
4	78	66
5	121	57
6	76	87
7	97	130
8	78	79
9	114	65
10	94	75
Average	**88.6**	**81.9**
Difference in Overall Time		**6.7 minutes ↓**

Every minute saved at this task saves a corresponding minute in the whole process for every patient with everything else constant

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Example: PAC's Cost Analysis

- Parent cost
  - $25.47 income per hour lost per parent
- Time loss
  - Clinic process
  - Travel time
- Loss to parent income
- Loss to Ontario economic productivity (80 patients per clinic)

Example: PAC's Cost Analysis

	Post-PAC's	Pre-PAC's	**Difference**
Time loss (minutes)	88.6 + 90	127.7 + 90	**39.1**
Loss of income (per parent)	$75.82	$92.40	**$16.58**
Loss of Ontario Productivity (per clinic)	$6065.26	$7392.07	**$1326.81**

Discussion

- At *low utilization levels*, the flow variability of the output **process** of a workstation is determined by the variability of the **arrival process** of jobs to this station.

- At *high utilization levels*, flow variability is mainly determined by the **process time** variability.

- **Since our patient flow is at a high utilization level, reducing process time variability is paramount.**

Discussion

- Waiting for X-Ray completion (Wait 3) is the most inefficient portion of the process time (Bottleneck)
  - A minute saved at the process saves 2.5 minutes of the total processing time.
- Variability in the process plays an important role.
  - All highly variable processes in the model save more overall time when reductions are made.

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Discussion

- If within a system we do not invest (pay) to reducing variability, one or more of the following will occur:
  - Lost throughput
  - Wasted capacity
  - Inflated cycle times
  - Long lead times and poor customer service
- Overall Goal – maximize capacity and make processes as efficient as possible

In our case

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Recommendations

- Reduction of time at “Bottlenecks”
  - Eliminating one process for registration
    - » Re-engineering required – two processes into one
  - Capacity Analysis
    - » Resource allocation – increase x-ray registers
- Earlier recommendations have already been fruitful
  - PACs introduction

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Contribution

- Improving the efficiency in health care delivery
- Implementing Best Practices
- Capacity Allocation

Next Steps

- Combining queues through process-reengineering – eliminate wait 2
- Analyze Patient Flow time
  - categorizing times examined in morning vs. afternoon, first time vs. repeat, post-checkup vs. fractures etc.
- Re-visit capacity allocation
- Advocacy for appropriately allocated resources
- PBMA: Program Budgeting and Marginal Analysis

Acknowledgements

- Manpreet Hora
- Richard Stivrins
- Orthopaedics Clinical Staff
  - Dr. Timothy P. Carey
  - Dr. Debra Bartley

Thank You!