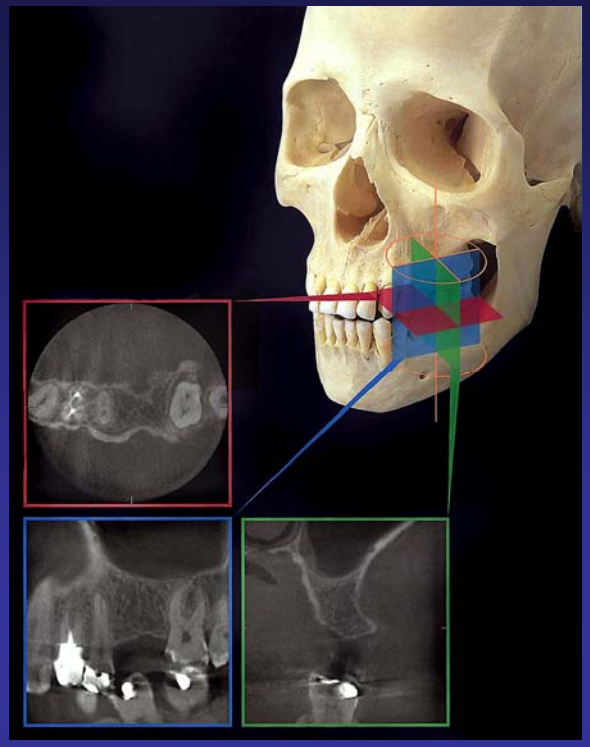
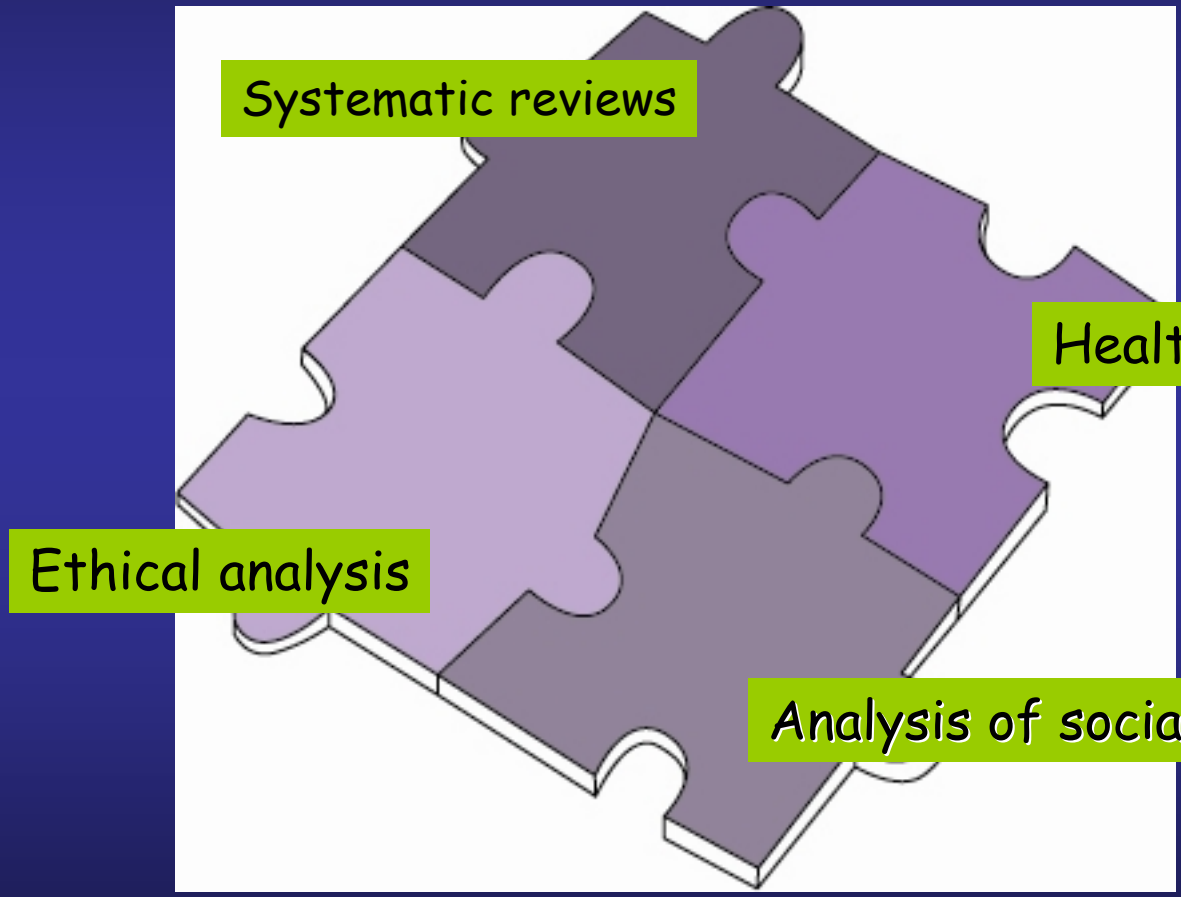
Health economics of CBCT



The gain of CBCT in terms of efficacy

Health Technology Assessment



Economical evaluation

"the comparative analysis of alternative courses of action in terms of their costs and consequences"

Drummond at al 2005

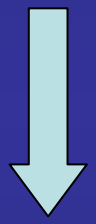
Cost-effective analysis

Analysis of costs and outcomes of alternative methods may differ in magnitude

Cost-minimization analysis

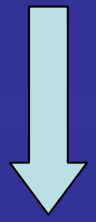
Outcomes of diagnosis/treatment are identical

Cost-utility analysis



The quality of health outcome following diagnosis/treatment – health related quality of life studies

Cost-benefit analysis



Consequences are expressed in monetary units

Why is it important?

Resources in health care are limited.

In choosing to use resources in one way one forgoes the opportunity to use the same resources in another competing way.

"There is a growing awareness that tests should be evaluated not on their intrinsic qualities (essentialism) but based on their consequences for patients' health and the use of health care resources (consequentialism). Acceptable diagnostic accuracy, though usually desired, is generally not sufficient for demonstrating benefits from testing."

Bossuyt PMM *EVIDENCE□BASEDMEDICAL TESTING*
Report prepared for the Dutch Health Care Insurance Board 2010

Continued…

– Economical evaluations that weight costs and effects of alternative interventions are particularly important in emerging (“creeping”) technologies to avoid inappropriate and excessive use

Research questions

How much does an examination with CBCT cost compared with conventional methods?

Which information will be gained from CBCT examinations compared with conventional diagnostic imaging methods in dentistry?

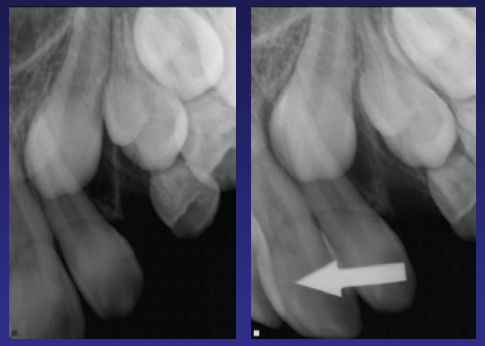
COST-EFFECTIVENESS

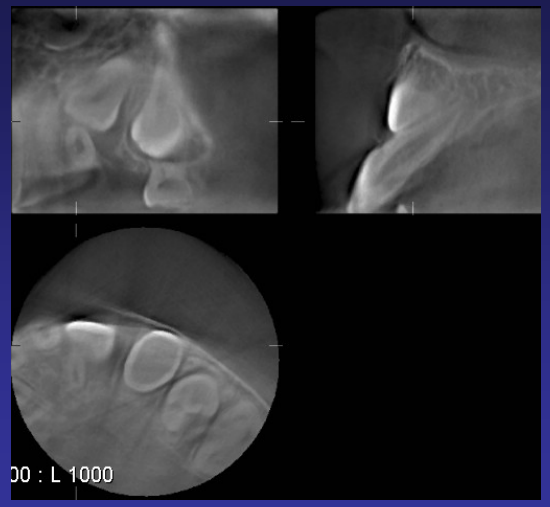
COST ANALYSIS

ANALYSIS OF CONSEQUENCES

THE ONLY PUBLICATION OF Diagnostic Imaging Methods IN ORAL HEALTH CARE presenting an evaluation of efficacy and costs

Norlund A, Axelsson S, Dahlén G, Espelid I, Mejare I, Tranaeus S, Twetman S. Economic aspects of the detection of occlusal dentine caries. Acta Odontol Scand 2009;67:38-43.





Conventional method

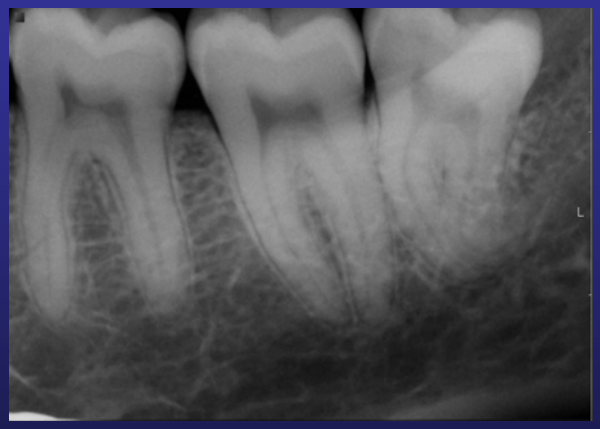
New method

A model for cost calculations of methods used in oral health care has to take into account

- Direct costs; capital costs, consumables and labour costs
- Indirect costs; patient time and costs

All items have to be identified (what),
measured (how much/how many)
and valued (unit costs)

The model was applied on different clinical situations in different health care systems



- The estimates for direct and indirect costs varied between the health care systems
- The variation in direct costs was mainly due to the capital costs for the CBCT-equipment (range 10.67 – 58.94 €)
- Variation in indirect costs were mainly due to examination fees (range 0 – 102.02 €). The examination fee varied according to clinical conditions within the same health care system
- A cost evaluation of a dental radiographic method cannot be generalised from one health care system to another but must take into account the specific circumstances

Costs of CBCT compared with costs for a conventional method

Application of the model for cost-analysis allowed us to compare each resource used to perform examinations of the two methods. The mean total cost per examination for the new method was 128.38€ and 81.80€ for the conventional method, resulting in an incremental cost per examination of the new method of 46.58€.

COST-EFFECTIVENESS

COST ANALYSIS

ANALYSIS OF CONSEQUENCES

Difference in diagnosis and confidence when using conventional or new method

Retained canine Observer ……..… Observation …….……. Date ……

Assessment of panoramic and intra-oral radiography

Patient id:…….. Canine: …….
Name:……..……..

Impacted canine

How confident are you in your assessment?

Position	**YES**	**NO**	**NOT POSSIBLE TO ASSESS**	**Not confident** — **Very confident**
Mediolateral position				
Horisontal	☐	☐	☐	
Vertical	☐	☐	☐	
Mesioangular	☐	☐	☐	
Distoangular	☐	☐	☐	
Bucco-lingual position				
Crown central	☐	☐	☐	
Crown buccal	☐	☐	☐	
Crown palatal	☐	☐	☐	
Root central	☐	☐	☐	
Root buccal	☐	☐	☐	
Root palatal	☐	☐	☐	
Distance crown to marginal bone				
Crown tip through marginal bone		☐		
1 – 5mm from marginal bone		☐		
5 – 10mm from marginal bone		☐		
> 10mm from marginal bone		☐		
Not possible to assess		☐		
Root morphology				
Root with open apex	☐	☐	☐	
Root with closed apex	☐	☐	☐	
Root curve or flex				
Curve at inferior 1/3 of root	☐	☐	☐	
Curve at inferior 2/3 of root	☐	☐	☐	
Curve at apical 1/3 of root	☐	☐	☐	
Curve in buccal direction	☐	☐	☐	
Curve in palatal direction	☐	☐	☐	
Curve in mesial direction	☐	☐	☐	
Curve in distal direction	☐	☐	☐	

Follicular size
< 3mm ☐
3-5mm ☐
> 5mm ☐

Resorption of neighbouring root

Central incisor	Lateral incisor	First premolar
☐ Root resorption definitely not present	☐ Root resorption definitely not present	☐ Root resorption definitely not present
☐ Root resorption probably not present	☐ Root resorption probably not present	☐ Root resorption probably not present
☐ Unsure (uncertain)	☐ Unsure (uncertain)	☐ Unsure (uncertain)
☐ Root resorption probably present	☐ Root resorption probably present	☐ Root resorption probably present
☐ Root resorption definitely present	☐ Root resorption definitely present	☐ Root resorption definitely present

IF resorption is present or probably present

Tooth….

Amount of resorption

Superficial ☐
Reaching ½ to pulp ☐
Reaching pulp ☐
Not possible to assess ☐

Placement of resorption

Mainly apical ☐
Mainly buccal ☐
Mainly palatal ☐
Mainly distal ☐
Mainly mesial ☐
Mainly other ☐

Tooth….

Amount of resorption

Superficial ☐
Reaching ½ to pulp ☐
Reaching pulp ☐
Not possible to assess ☐

Placement of resorption

Mainly apical ☐
Mainly buccal ☐
Mainly palatal ☐
Mainly distal ☐
Mainly mesial ☐
Mainly other ☐

How confident are you in your assessment?

Not confident **Very confident**

Comments: ……

Time for assessment……minut

RESULTS

Five observers assessed images from 60 maxillary canines with eruption disturbances

Significant differences between observers in time for assessment being longer for assessing CBCT images and in confidence, being higher for the new method

Root resorptions of neighbouring teeth

In 66% of the images five observer agreed on root resorption being present or not on the lateral incisor and made the same assessment with both methods.

For rootresorption on the first premolar the corresponding figure was 90%

Clinicians

Five orthodontists assessed radiographs of eight patients where basic data were the same for all patients but position of the maxillary canine and amount of resorption on one of the neighbouring teeth differed as observed with conventional or new method

Setting A

Information about the patient

Photo documentation of plaster model

Radiological report

Access to panoramic and intraoral radiographs

Setting B

Information about the patient

Photo documentation of plaster model

Radiological report

Access to panoramic and CBCT images

Case 1	X year old girl/boy with no space deficiency for the maxillary canine alt. space deficiency for the maxillary canine					
Radiographic report	Position of the canine and amount of resorption of the lateral					
Choose one of the treatment-alternatives and mark it with a X	**1**	**2**	**3**	**4**	**5**	**6**
	No treatment	Wait and see for one year	Keep the canine and move orthodontically	Keep the canine and move orthodontically	Keep the canine and move orthodontically	Extract the canine
			Keep the lateral incisor	Keep the lateral incisor	Extract the lateral incisor	Keep the lateral incisor
			Keep the first premolar	Extract the first premolar	Keep the first premolar	Keep the first premolar

Put a mark on the line to the right to show how confident you are in your treatment decision.	**How confident are you in your treatment decision?** **Not confident** **Very confident**

What information was the most important when You made Your treatment-decision?	
Comments	

CONVENTIONAL METHOD

Orthodontist

Patient	A	B	C	D	E
1	3	3	3	3	3
2	4	4	3	4	4
3	3	3	3	3	3
4	3	3	3	3	3
5	5	5	3	3	5
6	3	6	6	6	3
7	3	3	3	3	3
8	6	6	6	6	6

NEW METHOD

Orthodontist

Patient	A	B	C	D	E
1	3	3	3	3	3
2	4	4	3	4	5
3	3	3	3	3	5
4	3	3	3	3	3
5	5	6	3	5	5
6	3	3	6	3	6
7	3	3	3	3	3
8	6	6	6	6	6

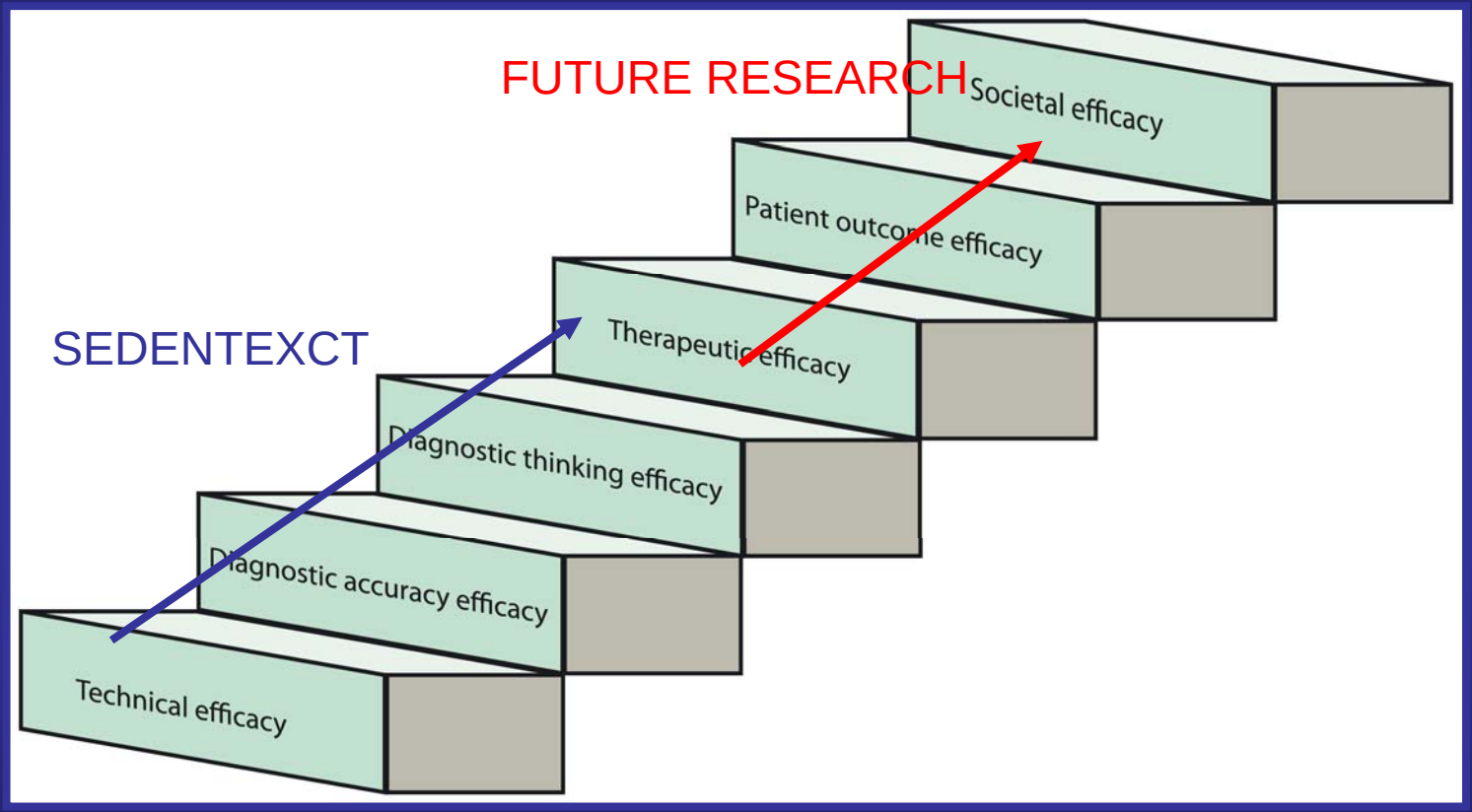
The change of treatment between the two settings in 4 of 7 cases did not depend on the different radiological reports, which in those cases were the same for the new and conventional method.

The new method cost 46.58€/examination
(Figures from Malmö, Sweden)

In the context of maxillary canines with eruption disturbances you will get a change
in 3 out of 40 treatment decisions

Future research ??

A hierarchical model for evaluation of diagnostic methods



Adapted from Fryback and Thornbury The efficacy of diagnostic imaging Med Decis Making 1991;11:88-94

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