

PROPHYLACTIC REMOVAL OF PATHOLOGY-FREE WISDOM TEETH: RAPID ASSESSMENT





Belgian Health Care Knowledge Centre

The Belgian Health Care Knowledge Centre (KCE) is an organization of public interest, created on the 24th of December 2002 under the supervision of the Minister of Public Health and Social Affairs. KCE is in charge of conducting studies that support the political decision making on health care and health insurance.

Executive Board

	Actual Members	Substitute Members
President	Pierre Gillet	
CEO - National Institute for Health and Disability Insurance (vice president)	Jo De Cock	Benoît Collin
President of the Federal Public Service Health, Food Chain Safety and Environment (vice president)	Dirk Cuypers	Chris Decoster
President of the Federal Public Service Social Security (vice president)	Frank Van Massenhove	Jan Bertels
General Administrator of the Federal Agency for Medicines and Health Products	Xavier De Cuyper	Greet Musch
Representatives of the Minister of Public Health	Bernard Lange	François Perl
	Marco Schetgen	Annick Poncé
Representatives of the Minister of Social Affairs	Oliver de Stexhe	Karel Vermeyen
	Ri De Ridder	Lambert Stamatakis
Representatives of the Council of Ministers	Jean-Noël Godin	Frédéric Lernoux
	Daniel Devos	Bart Ooghe
Intermutualistic Agency	Michiel Callens	Frank De Smet
	Patrick Verertbruggen	Yolande Husden
	Xavier Brenez	Geert Messiaen
Professional Organisations - representatives of physicians	Marc Moens	Roland Lemye
	Jean-Pierre Baeyens	Rita Cuypers
Professional Organisations - representatives of nurses	Michel Foulon	Ludo Meyers
	Myriam Hubinon	Olivier Thonon
Hospital Federations	Johan Pauwels	Katrien Kesteloot
	Jean-Claude Praet	Pierre Smiets
Social Partners	Rita Thys	Leo Neels
	Paul Palsterman	Celien Van Moerkerke
House of Representatives	Lieve Wierinck	



Control

Government commissioner

Yves Roger

Management

Chief Executive Officer
Assistant Chief Executive Officer
Managers Program Management

Raf Mertens
Jean-Pierre Closon
Christian Léonard
Kristel De Gauquier

Contact

Belgian Health Care Knowledge Centre (KCE)
Doorbuilding (10th Floor)
Boulevard du Jardin Botanique, 55
B-1000 Brussels
Belgium

T +32 [0]2 287 33 88

F +32 [0]2 287 33 85

info@kce.fgov.be

<http://www.kce.fgov.be>

PROPHYLACTIC REMOVAL OF PATHOLOGY-FREE WISDOM TEETH: RAPID ASSESSMENT

SABINE STORDEUR, MARIJKE EYSSEN



Title:	Prophylactic removal of pathology-free wisdom teeth: rapid assessment
Authors:	Sabine Stordeur, Marijke Eyssen
Reviewers:	Jean-Pierre Closon (KCE), Kristel De Gauquier (KCE), Frank Hulstaert (KCE), Christian Léonard (KCE), Raf Mertens (KCE), Hans Van Brabandt (KCE)
External Experts:	Marc Braem (UZ Antwerpen), Filip Cools (Cebam / VU Brussel), Raphaël Olszewski (Cliniques universitaires Saint-Luc), Constantinus Politis (ZOL Genk / UHasselt / Aporis), Eric Rompen (CHU Liège), Emmanuel Simons (Cebam), Pieter Van Meenen (RIZIV – INAMI)
Acknowledgements:	Sébastien Beun (Cliniques universitaires Saint-Luc), William D'hoore (Université catholique de Louvain), Raphaël Olszewski (Cliniques universitaires Saint-Luc), Stephan Devriese (KCE), et les auteurs du rapport "Santé bucco-dentaire de la population belge 2008-2010 – Système d'enregistrement et de surveillance" (Bottenberg Peter, Carvalho Joana, Declerck Dominique, Declerck Kathy, De Vos Eddy, Vanden Abbeele Astrid, Van Nieuwenhuysen Jean-Pierre, Vanobbergen Jacques)
External Validators:	Laurence Evrard (Hôpital Erasme, Bruxelles), Daniel van Steenberghe (KU Leuven), Isaïc Van der Waal (VU Amsterdam)
Conflict of interest:	None declared
Layout:	Ine Verhulst, Sophie Vaes

Disclaimer: The external experts were consulted about a (preliminary) version of the scientific report. Their comments were discussed during meetings. They did not co-author the scientific report and did not necessarily agree with its content.

Subsequently, a (final) version was submitted to the validators. The validation of the report results from a consensus or a voting process between the validators. The validators did not co-author the scientific report and did not necessarily all three agree with its content.

Finally, this report has been approved by common assent by the Executive Board.

Only the KCE is responsible for errors or omissions that could persist. The policy recommendations are also under the full responsibility of the KCE.

Publication date: 06 July 2012



Domain: Good Clinical Practice (GCP)
MeSH: Molar, Third; Tooth extraction; Tooth germ; Preventive Dentistry; Review Literature as Topic
NLM Classification: WU 605
Language: English
Format: Adobe® PDF™ (A4)
Legal depot: D/2012/10.273/49

Copyright: KCE reports are published under a “by/nc/nd” Creative Commons Licence
<http://kce.fgov.be/content/about-copyrights-for-kce-reports>.



How to refer to this document?

Stordeur S, Eyssen M. Prophylactic removal of pathology-free wisdom teeth: rapid assessment. Good Clinical Practice (GCP). Brussels: Belgian Health Care Knowledge Centre (KCE). 2012. KCE Report 182C. D/2012/10.273/49.

This document is available on the website of the Belgian Health Care Knowledge Centre.



■ EXECUTIVE SUMMARY

INTRODUCTION AND METHODOLOGY

Third molars, also called wisdom teeth, typically erupt between the ages of 18 and 24 years.

However, more than other teeth, wisdom teeth often fail to erupt (unerupted tooth) or erupt only partially (partially erupted tooth). Unerupted or partially erupted teeth may be impacted, which means they are prevented from completely erupting into a normal functional position, e.g. due to a lack of space or obstruction by another tooth. In English language papers, the term 'impacted tooth' is often used more generally, covering both unerupted and impacted teeth, as defined above.

- **A tooth is called pathology-free if it is clinically and/or radiologically free of any disease or pathological state. A pathological state can, but is not always associated with clinical symptoms.**
- **A tooth is called asymptomatic if the patient does not experience signs or symptoms of pain or discomfort associated with this tooth.**

There is mostly little or no controversy about the need to remove wisdom teeth showing pathological changes or disease. Examples are unrestorable caries (decay) of the wisdom tooth, recurrent pericoronitis i.e. inflammation of the tissues around the tooth, development of a cyst, etc.

This report is studying the removal of pathology-free wisdom teeth for preventive reasons. Unerupted, partially erupted or impacted wisdom teeth, without other clinical or radiological signs of pathology, are also considered to be pathology-free. Currently, it is not possible to accurately predict whether disease-free third molars, if they are left in place, will in the future develop pathological changes or not. Reasons that are frequently given for preventive extraction are: the risk of future disease should be minimized; the difficulty of surgery increases with age; early removal can prevent other teeth in the mouth to become shifted or misaligned; third molars have no role in the mouth; extracting all third molars during the same general anaesthesia when one of them has a defined indication for removal, limits the risks linked to possible future surgical removals.



Removal of third molars, for preventive reasons or not, often causes some side-effects, such as pain and swelling. It can also provoke complications, e.g. infection, damage to the nerve resulting in local numbness, injury to the adjacent teeth, or rare but very serious complications e.g. iatrogenic fracture of the jaw.

In Belgium, as in other Western countries, third molar extractions are performed by oral and maxillofacial surgeons (Dutch: “stomatologen”, French: “stomatologues”), and less complex extractions are also performed by dentists. It is currently not possible to extract full data on the practice of third molar removal in Belgium from the existing national databases. Some relevant information can be derived from the “Data Registration and Evaluation of the Oral Health of the Belgian Population 2008-2010”, a field study on oral health in the Belgian population, detailing the situation of the third molars per age category (see report paragraph 1.2.4). However, it contains no data on the rate of prophylactic extractions.

Whether prophylactic removal of pathology-free wisdom teeth is justified or not, depends on the trade-off between: (1.) the morbidity associated with retention until pathology emerges, and complications of curative removal; and (2.) the benefits and complications associated with prophylactic extraction. Systematic prophylactic removal is only justified if this trade-off, at the level of a whole population, is in the advantage of the prophylaxis.

This report presents the results of a systematic literature review on the prophylactic extraction of pathology-free third molars. Full guideline development in the Belgian context is beyond its scope. The report focuses on pathology-free upper and lower third molars, whether erupted, unerupted, partially erupted, or impacted, in adolescents and adults.

CURRENT KNOWLEDGE ABOUT PROPHYLACTIC REMOVAL OF PATHOLOGY-FREE THIRD MOLARS

Evidence of good quality in this domain is sparse. The methodological quality of the primary studies is low to very low. The three randomized controlled trials that could be included are more than 10 years old, but a search for primary (randomized or not) controlled clinical trials (RCTs or CCTs) of more recent date yielded no results. Most of the included studies explicitly focus on impacted wisdom teeth only.

The message emerging from this evidence is that prophylactic removal of pathology-free impacted wisdom teeth for orthodontic reasons in adolescents neither reduces nor prevents late problems of front teeth misalignment. The single RCT dealing with the management of non-orthodontic indications concludes that watchful waiting might be the more beneficial approach. The systematic review dealing with non-orthodontic indications concludes that existing reviews favoring prophylactic removal, are generally of poorer methodological quality than those concluding that prophylactic removal is unjustified. Two health technology assessment (HTA) reports conclude that there is still no scientific documentation available to either support or reject routine prophylactic removal of pathology-free wisdom teeth.

Decision analysis models compare prophylactic with symptomatic extraction for impacted third molars, including frequencies and ratings of severity of complications in both cases. They consistently suggest that patients' well-being is maximized if surgical removal is confined to wisdom teeth with pathological changes.

Several of the included publications stress the importance of clear communication with patients about expected benefits and potential side-effects and complications of the prophylactic removal of pathology-free third molars.



CONCLUSION

There is mostly little debate on the fact that third molars associated with clinical and/or radiological pathology, such as unrestorable caries, should be removed. However, there is a lack of proven benefit from the systematic prophylactic removal of pathology-free third molars, impacted or not, in all adolescents or (young) adults, and the procedure is not free of risk. Preventive actions at the level of the population are only recommended if the benefits outweigh the disadvantages, and if this is not the case it is preferable not to intervene. If there is no scientific evidence that an intervention is beneficial, the largely accepted principle of medicine: “primum non nocere”, “first, do no harm”, should be respected.



■ RECOMMENDATIONS^a

To the oral and maxillo-facial surgeons and dentists:

- Routine prophylactic removal of pathology-free third molars is not recommended.

To the Nationale raad voor kwaliteitspromotie/ Conseil national de promotion de la qualité:

- It is recommended to develop a patient leaflet containing clear and well-balanced information on the potential benefits, risks and cost of prophylactic removal of pathology-free wisdom teeth.

To the Technisch geneeskundige raad/ Conseil technique médical and the Technisch tandheelkundige raad/ Conseil technique dentaire at RIZIV/INAMI:

- A refinement of the existing Belgian nomenclature is recommended, to allow for follow-up of the existing Belgian practices in this domain, e.g. by expanding the obligation to report the number of every extracted tooth.
- Creation of a new nomenclature number for the removal of (impacted) wisdom teeth, that would be restricted to pathological conditions.

To the persons in charge of the Health Research System^b:

- There is a need for well-designed RCTs directly comparing prophylactic removal with management by deliberate retention, using long-term follow-up. Such studies should be helpful to better delineate those subgroups that might most benefit from prophylactic extraction, e.g. specific age groups, mandibular versus maxillar wisdom teeth etc.
- There is also a need for refined decision analysis models to compare long-term outcomes of prophylactic removal versus retention of third molars. Patient preferences, after they have been well informed, have also to be taken into account in these models.

^a These recommendations are under the sole responsibility of the KCE

^b As described by the Cour des comptes/ Rekenhof in its audit on January 2010 : « Scientific support for the Federal Health Policy »



■ TABLE OF CONTENTS

	LIST OF FIGURES	3
	LIST OF TABLES.....	3
	LIST OF ABBREVIATIONS	4
■	SYNTHESIS	5
1	BACKGROUND	5
2	CURRENT PRACTICE IN BELGIUM	7
3	SCOPE OF THIS REPORT AND METHODOLOGY	8
4	CURRENT KNOWLEDGE ABOUT PROPHYLACTIC REMOVAL OF PATHOLOGY-FREE THIRD MOLARS	8
4.1	ORTHODONTIC INDICATIONS	8
4.2	NON-ORTHODONTIC INDICATIONS	8
4.3	DECISION ANALYSIS	9
4.4	NEED OF WELL-BALANCED COMMUNICATION.....	9
5	CONCLUSION	9
6	REFERENCES.....	10
■	SCIENTIFIC REPORT	11
1	INTRODUCTION.....	11
1.1	BACKGROUND.....	11
1.2	CURRENT PRACTICE IN BELGIUM.....	13
1.2.1	NIHDI nomenclature data	13
1.2.2	Data from sickness funds.....	13
1.2.3	Data from a private insurance company	14
1.2.4	The report “Data Registration and Evaluation of the Oral Health of the Belgian Population 2008-2010”.....	14
1.3	SCOPE OF THIS REPORT.....	17
2	METHODOLOGY	18



2.1	GENERAL APPROACH	18
2.2	LITERATURE SEARCHES	18
2.2.1	Search strategy	18
2.2.2	Quality appraisal	19
2.2.3	Data Extraction	20
3	CURRENT KNOWLEDGE ABOUT PROPHYLACTIC REMOVAL OF PATHOLOGY-FREE THIRD MOLARS	20
3.1	NUMBER OF RETRIEVED PUBLICATIONS.....	20
3.1.1	Systematic reviews	20
3.1.2	Health technology assessment reports.....	20
3.1.3	Clinical practice guidelines.....	21
3.1.4	RCTs or CCTs.....	21
3.1.5	Conclusion	21
3.2	RESULTS: SYSTEMATIC REVIEWS	21
3.2.1	Song et al. (2000)	21
3.2.2	Mettes et al. (2005)	23
3.3	RESULTS: CLINICAL PRACTICE GUIDELINE AND HTA REPORTS	24
3.3.1	NICE guideline (2000).....	24
3.3.2	HTA report from The Canadian Agency for Drugs and Technologies in Health (2010)	24
3.3.3	HTA report from the Regional HTA Centre of the Region Västra Götaland in Sweden (2010).....	25
3.4	DISCUSSION AND CONCLUSION	25
3.4.1	Methodological quality	26
3.4.2	Literature review	26
3.4.3	Conclusion	26
■	APPENDICES	27
	APPENDIX 1.	27
	APPENDIX 1.1. NIHDI NOMENCLATURE (INAMI/RIZIV).....	27
	APPENDIX 2.	38
	APPENDIX 2.1. GRADE SYSTEM: LEVELS OF EVIDENCE.....	38



APPENDIX 2.2. AGREE INSTRUMENT (VERSION II)39

APPENDIX 3.41

APPENDIX 3.1. PUBMED SEARCH STRATEGY: GUIDELINES, SYSTEMATIC REVIEWS,
META-ANALYSES 41

APPENDIX 3.2. EMBASE SEARCH STRATEGY: GUIDELINES, SYSTEMATIC REVIEWS,
META-ANALYSES 42

APPENDIX 3.3. PUBMED SEARCH STRATEGY: RCT AND CCT43

APPENDIX 3.4. EMBASE SEARCH STRATEGY: RCT AND CCT 44

APPENDIX 3.5. OTHER SEARCH STRATEGIES 44

APPENDIX 4.45

APPENDIX 4.1. IDENTIFIED GUIDELINES AND THEIR QUALITY APPRAISAL (AGREE SCORE)45

APPENDIX 4.2. IDENTIFIED SYSTEMATIC REVIEWS AND THEIR QUALITY APPRAISAL
(DUTCH COCHRANE EVALUATION)46

APPENDIX 4.3. EVIDENCE TABLES50

APPENDIX 4.4. STAKEHOLDER MEETING57

■ **REFERENCES.....60**

LIST OF FIGURES

Figure 1.1: Graphical representation of Table 1.2. Status of third molars in a sample of the Belgian population per age category, average of the four mouth quadrants.

LIST OF TABLES

Table 1.1: Status of third molars in a sample of the Belgian population.

Table 1.2: Status of third molars in a sample of the Belgian population per age category, average of the four mouth quadrants.



LIST OF ABBREVIATIONS

ABBREVIATION	DEFINITION
CCT	Controlled clinical trial
CPG	Clinical practice guideline
HAS	Haute Autorité de Santé (France)
HTA	Health Technology Assessment
INAMI	Institut National d'Assurance Maladie-Invalidité (see NIHDI)
NICE	National Institute for Clinical Evidence
NIHDI	National Institute for Health and Disability Insurance (INAMI/RIZIV)
RCT	Randomized Controlled Trial
RIZIV	RijksInstituut voor Ziekte- en InvaliditeitsVerzekering (see NIHDI)
SIGN	Scottish Intercollegiate Guidelines Network
US	United States



■ SYNTHESIS

1 BACKGROUND

Third molars, also called wisdom teeth, typically erupt between the ages of 18 and 24 years^{1, 2}. However, more than other teeth, wisdom teeth often fail to erupt (unerupted tooth) or erupt only partially (partially erupted tooth)³.

- **An unerupted tooth lies within the jaws and remains entirely covered by soft tissue, and partially or completely covered by bone.**
- **A partially erupted tooth failed to erupt fully into a normal position and is only partly visible or in communication with the oral cavity.**
- **Unerupted or partially erupted teeth may be impacted, which means they are prevented from completely erupting into a normal functional position. This may be due to a lack of space, obstruction by another tooth, or an abnormal eruption path.**
- **In English language papers, the term 'impacted tooth' is often used more generally, covering both unerupted and impacted teeth, whereas when 'unerupted tooth' is mentioned, it only covers an 'unerupted tooth', as defined above.**

There is mostly little or no controversy about the need to remove wisdom teeth showing pathological changes or disease. Examples are unrestorable caries (decay) of the wisdom tooth, recurrent pericoronitis i.e. inflammation of the tissues around the tooth, development of a cyst, etc.

- **A tooth is called pathology-free if it is clinically and/or radiologically free of any disease or pathological state. A pathological state can, but is not always associated with clinical symptoms.**
- **A tooth is called asymptomatic if the patient does not experience signs or symptoms of pain or discomfort associated with this tooth.**



This report is studying the prophylactic removal of pathology-free wisdom teeth. This implies (surgical) removal of wisdom teeth that are considered to be free of any local pathology or disease, based on clinical and/or radiological evaluation. In this study, the notions of 'symptom-free' or 'asymptomatic' will not be used, as even a symptom-free tooth can be subject to pathological conditions. Unerupted, partially erupted or impacted wisdom teeth, without other clinical or radiological signs of pathology, are also considered to be pathology-free.

It is clear that, over time, teeth can undergo an evolution, in the sense that previously pathology-free teeth can become symptomatic and show signs of disease. The problem is that, with our current knowledge, it is not possible to accurately predict which disease-free third molar, if left in place, will eventually develop pathological changes and which one will not.

In daily practice, prophylactic removal of third molars has become a widespread practice⁴. Oral and maxillofacial surgeons (Dutch: "stomatologen", French: "stomatologues") or dentists typically give various reasons for the early removal of pathology-free third molars. The following reasons are often quoted⁵: the risk of future disease should be minimized; the difficulty of surgery increases with age; early removal can prevent other teeth in the mouth to become shifted or misaligned; third molars have no role in the mouth; extracting all third molars during the same general anaesthesia when one of them has a defined indication for removal, limits the risks linked to possible future surgical removals.

Removal of third molars, for prophylactic reasons or not, can potentially have side-effects and complications including⁵⁻⁸:

- pain, swelling, and trismus (muscle cramps at the jaw); secondary hemorrhage;
- inferior or lingual nerve damage resulting in temporary or permanent labial or lingual paresthesia or anaesthesia;
- alveolar osteitis ("dry socket", meaning dry appearance of the exposed bone in the socket);
- local or systemic infection, including osteomyelitis;
- injury to the adjacent teeth and/or adjacent hard or soft tissues (e.g. damage to the second molar, temporary or persistent periodontal injury);

- incomplete tooth removal and retention of fragments;
- iatrogenic mandibular / maxillary fracture;
- oronasal or oroantral fistula; introduction of tooth fragments in e.g. maxillary sinus;
- temporo-mandibular joint disorder and/or associated muscular disorder;
- complications associated with each surgical procedure, e.g. surgery of incorrect side, complications with local or general anaesthesia.

The surgical removal of upper third molars is in general easier and associated with less postoperative morbidity than removal of lower third molars³.

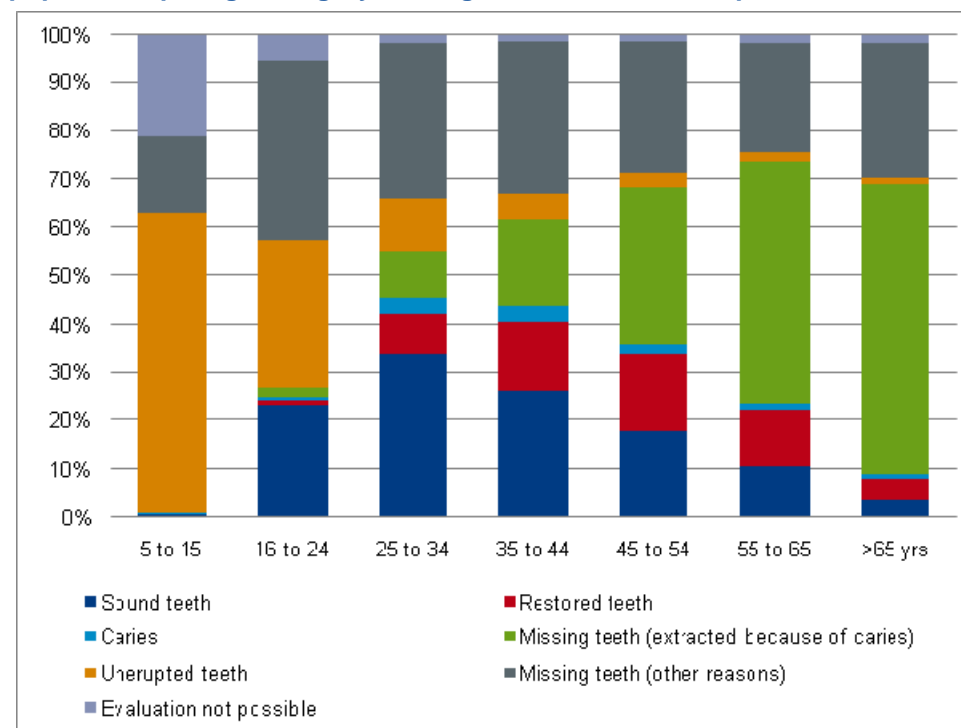


2 CURRENT PRACTICE IN BELGIUM

In Belgium, as in other Western countries, third molar extractions are performed by oral and maxillofacial surgeons, and less complex extractions are also performed by dentists. However, it is difficult to get a clear view on the current practice of third molar extractions in Belgium, because only few data exists. The RIZIV/INAMI nomenclature covering tooth extractions has changed very frequently over the last years. Currently, non-complicated tooth extraction is only reimbursed in very limited indications and for specific age categories, and the nomenclature codes do not specify which tooth is extracted. Since 2009, the sickness funds collect data in a global database on which tooth is extracted, but only for those procedures that are reimbursed; and some nomenclature codes are not included in this system. Moreover, these data do not include the reason for extraction: prevention or treatment. Some private insurance companies reimburse dental interventions not covered by the statutory health insurance, and collect data on which tooth is extracted and for what reason. However, the population covered by private insurance companies is probably not representative of the whole Belgian population, and these data are hard to obtain.

The most relevant data are those from the “Data Registration and Evaluation of the Oral Health of the Belgian Population 2008-2010”⁹, a study published in 2011. In this study, dentists visited a representative sample of the Belgian population at home to collect data on oral health; 2 567 participants had an examination of their oral health status. A supplementary analysis for third molars has been performed on these data for the current report, and is presented below in Figure 1.1. As expected, unerupted as well as sound (healthy) teeth are most often encountered in the youngest age categories. For missing teeth, the reasons that are mentioned (“caries” or “other” reason) are based on recall of the participant (anamnesis), and should therefore be read with caution. More details are given in chapter 1.2.4.2.

Figure 1.1 - Status of third molars in a sample of the Belgian population, per age category; average of the four mouth quadrants.



Source: database Oral Health of the Belgian Population 2008-2010. Note: missing data were excluded.



3 SCOPE OF THIS REPORT AND METHODOLOGY

Whether systematic prophylactic removal of pathology-free wisdom teeth is justified or not, depends on the trade-off between: (1) the morbidity associated with retention until pathology emerges, and complications of curative removal; and (2) the benefits and complications associated with prophylactic extraction. *Systematic* prophylactic removal is only justified if this trade-off, *at the level of a whole population*, is in the advantage of the prophylaxis.

This report presents the results of a systematic literature review, including existing systematic reviews, health technology assessment (HTA) reports, and primary (randomized or not) controlled clinical trials (RCTs or CCTs) (see also chapter 2). Full guideline development in the Belgian context was beyond the scope of this report, but existing clinical practice guidelines (CPGs) were looked for to facilitate the formulation of clinically relevant recommendations. The report focuses on pathology-free upper and lower third molars, whether erupted, unerupted, partially erupted, or impacted, in adolescents and adults.

4 CURRENT KNOWLEDGE ABOUT PROPHYLACTIC REMOVAL OF PATHOLOGY-FREE THIRD MOLARS

Despite the fact that prophylactic removal of pathology-free wisdom teeth is a widespread practice in many Western countries^{3,4,6,10,11}, evidence of good quality is sparse: only 2 systematic reviews based on 3 RCTs, and 2 HTA reports were of sufficient quality to be eligible for analysis^{7,11-15}. Nevertheless, the methodological quality of the primary studies is low to very low. The included RCTs are of older date, but a search for RCTs or CCTs of more recent date yielded no results. Most of the included studies explicitly focus on fully or partially *impacted* wisdom teeth only, and the prophylactic extraction of erupted wisdom teeth has been very little studied. Only the NICE guideline, based on one of the included systematic reviews, responded to the preset quality criteria for CPGs.

4.1 Orthodontic indications

The message emerging from this evidence is that prophylactic removal of pathology-free impacted wisdom teeth for orthodontic reasons in adolescents neither reduces nor prevents late problems of front teeth misalignment. There are no publications of sufficient quality on the removal for orthodontic reasons in adults.

4.2 Non-orthodontic indications

The single RCT dealing with the management of non-orthodontic indications concludes that watchful waiting might be the more beneficial approach. The systematic review dealing with non-orthodontic indications, includes other reviews on this matter. Whereas the large majority of these reviews does not reach clear conclusions, some reviews conclude that prophylactic removal is unjustified, while some others suggest that prophylactic removal could be justified. However, the latter are of poorer methodological quality. The two HTA reports conclude that there is still no scientific documentation available to either support or reject routine prophylactic removal of pathology-free wisdom teeth.



4.3 Decision analysis

Basically, the question boils down to the balance between the morbidity associated with retention and late removal, and the benefits of prophylactic removal and/or the surgical complications associated with it, when it would be applied to the entire pathology-free population of adolescents or (young) adults. While most literature reviews compare both strategies globally, they only can give a general impression of the balance between them. However, only a decision analysis approach would be able to tackle the issue in a more scientific way.

Only one systematic review describes 4 decision analyses, which systematically include frequencies of complications associated with retention and symptomatic removal on the one hand and associated with prophylactic removal on the other hand. To compare the different types of complications, ratings of severity by clinicians and/or by patients are used. The findings consistently suggest that patients' well-being is maximized if surgical removal is confined to impacted third molars with pathological changes.

4.4 Need of well-balanced communication

Several of the included publications stress the importance of clear communication with patients about expected benefits and potential side-effects and complications of the prophylactic removal of pathology-free third molars.

5 CONCLUSION

There is mostly little debate on the fact that third molars associated with clinical and/or radiological pathology, such as unrestorable caries, should be removed. However, there is a lack of proven benefit from the systematic prophylactic removal of pathology-free third molars, impacted or not, in all adolescents or (young) adults, and the procedure is not free of risk. Preventive actions at the level of the population are only recommended if the benefits outweigh the disadvantages, and if this is not the case, it is preferable not to intervene. If there is no scientific evidence that an intervention is beneficial, the largely accepted principle of medicine: "*primum non nocere*", "first, do no harm", should be respected.



6 REFERENCES

1. Garcia RI, Chauncey HH. The eruption of third molars in adults: a 10-year longitudinal study. *Oral Surg Oral Med Oral Pathol.* 1989;68(1):9-13.
2. Hugoson A, Kugelberg CF. The prevalence of third molars in a Swedish population. An epidemiological study. *Community Dent Health.* 1988;5(2):121-38.
3. Scottish Intercollegiate Guidelines Network. Management of unerupted and impacted third molar teeth - A national clinical guideline. Edinburgh: 1999. SIGN 43SIGN 43
4. National Institute for Clinical Excellence. Guidance on the Extraction of Wisdom Teeth. London: National Institute for Clinical Excellence; 2000. Technology Appraisal Guidance 1
5. Kandasamy S, Rinchuse DJ. The wisdom behind third molar extractions. *Aust Dent J.* 2009;54(4):284-92.
6. Agence Nationale d'Accréditation et d'Evaluation en Santé. Indications et non-indications de l'avulsion des troisièmes molaires mandibulaires. Paris: ANAES; 1997.
7. Song F, O'Meara S, Wilson P, Golder S, Kleijnen J. The effectiveness and cost-effectiveness of prophylactic removal of wisdom teeth. York: NHS Centre for Reviews and Dissemination; 2000. 415.
8. The Royal College of Surgeons of England. The management of patients with third molar (syn: wisdom) teeth. London: Faculty of Dental Surgery RCS; 1997. Current clinical practice and parameters of care.
9. Bottenberg P, Carvalho J, Declerck D, Declerck K, De Vos E, Vanden Abbeele A, et al. Data Registration and Evaluation of the Oral Health of the Belgian Population 2008-2010. 2011 June 2011. Available from:
www.ice.ugent.be
<http://www.riziv.fgov.be/information/nl/studies/study53/index.htm>
<http://www.inami.fgov.be/information/fr/studies/study53/index.htm>
10. Friedman JW. The prophylactic extraction of third molars: a public health hazard. *American journal of public health.* 2007;97(9):1554-9.
11. Suska F, Kjeller G, Molander A, Samuelsson O, Svanberg T, Liljegren A. Removal of impacted wisdom teeth. Göteborg: Sahlgrenska Universitetssjukhuset; 2010. HTA Rapport 2010:30
12. Canadian Agency for Drugs and Technologies in Health. Prophylactic Removal of Wisdom Teeth: A Review of the Clinical Benefit and Guidelines. Health Technology Inquiry Service; 2010.
13. Harradine N, Pearson M, Toth B. The effect of extraction of third molars on late lower incisor crowding: a randomized controlled trial. *Br J Orthod* 1998;25:117-22.
14. Mettes TG, Nienhuijs ME, van der Sanden WJ, Verdonschot EH, Plasschaert AJ. Interventions for treating asymptomatic impacted wisdom teeth in adolescents and adults. *Cochrane Database Syst Rev.* 2005(2):CD003879.
15. Vondeling H, Maningky M, Bezemer D, Smeele LE, Baart JA, van der Waal I. Issues in the design and preliminary results of a randomized controlled trial comparing the effects and costs of preventive removal of third molars versus removal on indication. In: Proceedings of 15th Annual Meeting of the ISTAHC; 1999; Edinburgh, Scotland.



■ SCIENTIFIC REPORT

1 INTRODUCTION

1.1 Background

Third molars, also called wisdom teeth, typically erupt into the mouth between the ages of 18 to 24 years, although eruption outside of this age range is not uncommon^{1, 2}.

However, more than other teeth, wisdom teeth often fail to erupt (unerupted tooth) or erupt only partially (partially erupted tooth). An unerupted tooth lies within the jaws and remains entirely covered by soft tissue, and partially or completely covered by bone³. A partially erupted tooth failed to erupt fully into a normal position and is only partly visible or in communication with the oral cavity³. Unerupted or partially erupted teeth may be impacted, which means they are prevented from completely erupting into a normal functional position. This may be due to a lack of space, obstruction by another tooth, or an abnormal eruption path³. However, in English written papers, the term 'impacted tooth' is often used more generally, covering both unerupted and impacted teeth, whereas when 'unerupted tooth' is mentioned, it only covers 'unerupted tooth'⁴.

A wisdom tooth is called pathology-free if it is clinically and/or radiologically free of any disease or pathological state. A pathological state can, but is not always associated with clinical symptoms. A wisdom tooth is called asymptomatic if the patient does not experience signs or symptoms of pain or discomfort associated with this tooth. The prophylactic removal of pathology-free wisdom teeth is defined as the (surgical) removal of wisdom teeth in the absence of any local pathology or disease, based on clinical and/or radiological evaluation^{5, 6}. It is clear that over time, there can be an evolution so that previously pathology-free teeth become symptomatic and show signs of disease.

There is mostly little or no controversy about the need to remove symptomatic wisdom teeth showing pathological changes or disease. Examples are unrestorable caries (decay) of the wisdom tooth, non-treatable pathology of the tooth root (pulpal and/or periapical pathology), development of a dentigerous cyst or tumor, etc.^{3, 4, 6, 7}. Other reasons for third molar extraction that are often mentioned are, without being exhaustive, the presence of a specific medical or surgical condition, e.g. chemo- or radiotherapy; if the third molar is impeding orthognatic surgery



or is needed as a donor tooth, etc.^{3,4,6,7}. For some pathological conditions, e.g. the presence of periodontitis (inflammation and loss of connective tissues surrounding the tooth), there is discussion in the scientific literature whether or not this is an indication for removal^{8,9}.

Whereas for most types of pathological changes there has been no controversy about the need to remove the teeth, the routine removal of disease-free third molars remains controversial but nevertheless it is a common practice^{3,4,6}. However, a wide variation in the management of pathology-free third molars among dental practitioners is reported^{3,4,10,11}.

Currently, it is not possible to accurately predict whether disease-free third molars will develop pathological changes if they are not removed. In daily practice, oral and maxillofacial surgeons (Dutch: “stomatologen”, French: “stomatologues”) or dentists typically give various reasons for the early removal of pathology-free third molars, but almost all of these reasons are not based on high-quality evidence. The following reasons are often used: the risk of future disease should be minimized, the difficulty of surgery increases with age, and third molars have no role in the mouth⁶. Another reason frequently invoked to promote the prophylactic extraction of third molars is the potential role that this practice could play to prevent late lower incisor crowding and to avoid other teeth in the mouth to become shifted or misaligned^{5,6,10}. Wisdom teeth crowding refers to the theory that erupting wisdom teeth push and shift the anterior teeth forward and thus cause their crowding.

Another practice consists in extracting all third molars during the same general anaesthesia when one of them has a defined indication for removal. This should avoid future anaesthetic procedures and the risks associated with it: if only the third molar with a defined indication is removed, another anaesthesia will be necessary should one of the remaining third molars later on develop a pathological condition¹².

Removal of third molars, for prophylactic reasons or not, can potentially have side-effects and complications including^{4,6,11,12}:

- pain, swelling, and trismus (muscle cramps at the jaw); secondary hemorrhage;
- inferior or lingual nerve damage resulting in temporary or permanent labial or lingual paresthesia or anaesthesia;

- alveolar osteitis (“dry socket”, meaning dry appearance of the exposed bone in the socket);
- local or systemic infection, including osteomyelitis;
- injury to the adjacent teeth and/or adjacent hard or soft tissues (e.g. damage to the second molar, temporary or persistent periodontal injury);
- incomplete tooth removal and retention of fragments;
- iatrogenic mandibular / maxillary fracture;
- oronasal or oroantral fistula; introduction of tooth fragments in e.g. maxillary sinus;
- temporo-mandibular joint disorder and/or associated muscular disorder;
- complications associated with each surgical procedure, e.g. surgery of incorrect side, complications with local or general anaesthesia.

The practice of prophylactic removal of third molars is advocated by almost all oral and maxillofacial surgeons and many general dentists in the US¹³. The 5 500 oral and maxillofacial surgeons in the US in private practices account for the removal of at least 7 out of the 10 million third molars extracted annually in about 5 million individuals (for a population of about 300 million people). Also in Europe^{3,4,14,15}, the removal of third molars, and especially impacted third molars, is a highly common surgical procedure in oral and maxillofacial surgery and dentistry and induces an increasing cost burden for patients as well as for the national health care reimbursement fund. Therefore, the decision to extract pathology-free third molars has to be based on sufficient evidence.



1.2 Current practice in Belgium

In Belgium, as in other Western countries, third molar extractions are performed by oral and maxillofacial surgeons, and less complex extractions are also performed by dentists. The importance of the development of national guidelines in the domain of oral health care, has already been highlighted by D. van Steenberghe and G. Perl in 2003, in the “Strategic Plan Oral Health, scientific founding”, a document presented to the Federal Public Service of Social Affairs^a. However, it is difficult to get a clear view on the current practice of tooth extractions in Belgium, including third molar extractions, because only few data exists. This will be explained in the next paragraphs by giving an overview of different data sources. The most relevant data come from the study “Data Registration and Evaluation of the Oral Health of the Belgian Population 2008-2010” (paragraph 1.2.4)¹⁶.

1.2.1 NIHDI nomenclature data

The Belgian fee-for-service system has specific “nomenclature codes” that foresee tariffs and reimbursement rates for, among other, specific medical acts or acts by dentists. The system is overseen by the NIHDI (National Institute for Health and Disability Insurance) (RIZIV/INAMI, Rijksinstituut voor Ziekte-en InvaliditeitsVerzekering/ L'Institut National d'Assurance Maladie-Invalidité).

When exploring the NIHDI nomenclature data, the following difficulties are encountered:

- The nomenclature covering extractions by oral and maxillofacial surgeons or dentists has changed very frequently over the last years (see Appendix 1). Non-complicated tooth extractions in adults were not reimbursed in 2005 and 2006, and as from 2007 onwards in very limited indications and for specific age categories only. Therefore, the analysis of the volume of extractions by age based on registered nomenclature acts does not seem to be feasible after 2004.

- The nomenclature does not specify which tooth is extracted. Hence, it is not known which is the percentage of extracted third molars as compared to other teeth.
- The nomenclature does not give an indication on the reason for extraction. Hence, it is not possible to know how many teeth have been extracted for medical/dental pathology and how many have been extracted prophylactically.

1.2.2 Data from sickness funds

Reimbursement to the patients is organized through the sickness funds.

A tooth numbering system is used in oral health care for uniquely identifying and referring to a specific tooth. When reimbursement is foreseen, the number of the extracted tooth has to be mentioned on the written application for the reimbursement. As from 2009 onwards, all the sickness funds put these numbers systematically in a global database. However, when no nomenclature act and reimbursement are foreseen (see 1.2.1), there are no data anyhow. Moreover, there are exceptions for which reimbursement exists but without obligation to mention the tooth number. These exceptions are mentioned in Appendix 1 with an asterisk (*); most of these nomenclature codes can only be used by oral and maxillofacial surgeons. According to experts in the field, the nomenclature codes 312410-312421 and 312432-312443 are often used for extraction of wisdom teeth; for these nomenclature codes, there is no obligation to mention the tooth number^b.

^a “Strategisch Plan Mondzorg, Wetenschappelijke fundering/ Plan Stratégique soins buccaux: Fondements Scientifiques” D van Steenberghe, G. Perl, March 2003 (<http://www.omfs.be/Default.aspx?PageID=232&Culture=nl>)

^b For these nomenclature codes, the tooth number has been mentioned in 4% of cases in the global sickness fund database (communication personnelle, Etienne Laurent, Direction médicale, Alliance nationale des Mutualités chrétiennes)



1.2.3 Data from a private insurance company

Since official social security institutions do not have valid and accurate data about volume and reimbursement of third molar extractions, a private insurance company, DKV Belgium S.A./N.V (www.dkv.be), was contacted. This company offers its customers the reimbursement of some of ambulatory healthcare expenses not covered by the NIHDI nomenclature, including dental interventions, depending on the type of contract. The original DKV patient records contain data on the tooth number and the indication for tooth extraction. However, the following difficulties were encountered:

- Like each private insurance company, DKV covers only a part of the Belgian population. So, even a random sample of patients of DKV would not be representative of the whole Belgian population.
- DKV only has a partial database of patients records, without identification of the extracted tooth. Hence, manual extraction from the original DKV patient records would be required. Given budget limits, only a small sample of records would be available and used for analysis, which would increase significantly the risk for selection bias. Therefore, it was decided not to explore the DKV records.

1.2.4 The report “Data Registration and Evaluation of the Oral Health of the Belgian Population 2008-2010”

1.2.4.1 Belgian data on oral health: a field study

On request of the NIHDI Committee of the Insurance for Healthcare, a study was launched in 2008, aiming at collecting field data on oral health in the Belgian population. The study¹⁶, first in Belgium in this domain and published in November 2011, has been conducted by the ICE/CIE (Interuniversitaire Cel Epidemiologie/ Cellule Interuniversitaire Épidémiologie), an interuniversity consortium dealing with epidemiology in the field of oral and dental care. There was a close collaboration with the steering committee for quality promotion among dentists that is organized within the NIHDI.

In the study, dentists visited a sample of the Belgian population at home, and evaluated their oral and dental state. The sample was representative of the whole Belgian population, with the exception that persons <5 years

of age were excluded and persons >75 years of age were deliberately overrepresented. The participants also filled out a questionnaire e.g. on the frequency of tooth brushing etc. Additionally, data on their medical and dental care consumption was collected through the IMA (Intermutualistic Agency, collecting and evaluating data from the 7 Belgian sickness funds). The sample included 1 330 households and 3 057 persons, of whom 2 742 persons (90%) filled out the questionnaire and 2 567 persons (84%) consented to have an oral evaluation. The results, for which the interested reader is referred to the original report¹⁶, deal among other with the frequency of dental decay, periodontitis, dental fillings, and missing teeth; and with aspects of eating habits, oral hygiene and quality of life related to oral health. Frequency of contact with dentists as well as oral and maxillofacial surgeons in the Belgian population is also reported.

1.2.4.2 Belgian data on third molars

Given the paucity of existing Belgian data on extraction of third molars, as discussed before, the authors of the report “Data Registration and Evaluation of the Oral Health of the Belgian Population 2008-2010”¹⁶ were contacted, and specific data on third molars have been retrieved from the original ICE/CIE database for the present report.

As explained above, 2 567 persons consented to have an oral evaluation. The status of third molars as notified during the visits at home is presented in Tables 1.1 and 1.2. The data of Table 1.2 is also graphically represented in Figure 1.1. The number of persons for whom data for third molars were available varied between the four quadrants of the mouth from 2 210 to 2 224. This implies that the percentage of missing data, i.e. no data filled out, varied between the four quadrants from 13.4% to 13.9% (average 13.7%). These missing data were excluded from the further presentation of results. Averages of available data for two (Table 1.1) respectively four mouth quadrants (Table 1.1 and 1.2) are presented.

From these tables it is clear that up to the age of 25-35, many third molars remained unerupted.

As to extraction of third molars because of caries (decay), there was a gradual increase with increasing age category, and above the age of 65 years, 60% of all third molars was extracted because of this reason.



On the other hand, the percentage of third molars that were missing because of “other reasons” showed a peak in the age category of 16-24 years. At this age 37.3% of the participants had third molars missing because of “other reasons”, whereas for older age categories this percentage was lower. The category “Missing because of other reasons” contains mainly teeth extracted for medical indications other than caries, teeth extracted for preventive reasons, and tooth agenesis. The latter category can overlap somewhat with the category “unerupted”, because during an evaluation at home and without radiological assessment, the difference between tooth agenesis and an unerupted tooth was not easy to make. It can be assumed that within the time course of one or two generations, the rate of tooth agenesis remained stable in a certain population. Therefore, the finding that the category “Missing because of other reasons” showed a peak in the age category of 16-24 years seems to point to an increasing tendency to remove third molars in adolescents and young adults for reasons other than unrestorable decay. Whether these reasons were prophylactic or curative (i.e. for a specific pathology) in nature, is not known from these data.

The data registration on which these tables were based had some methodological flaws that are almost inherent to this type of large scale epidemiological evaluations. First, the evaluations took place at home, so the examining dentists were limited as to the equipment available for evaluation. Second, the “reasons for extraction” were reported as mentioned by the participant and based on his recall (anamnesis). Both these limitations add to the uncertainty that should be taken into account when reading the tables below.

Table 1.1 – Status of third molars in a sample of the Belgian population.

	% of Maxillar (upper jaw) third molars	% of Mandibular (lower jaw) third molars	% of All third molars
Sound ^c	14.9	13.9	14.4
Restored	6.8	10.3	8.6
Caries	1.5	2.0	1.7
Unerupted	11.2	11.6	11.4
Missing (caries ^d)	34.3	31.5	32.9
Missing (other ^e)	27.6	27.2	27.4
Evaluation not possible ^f	3.9	3.7	3.8
Total	100%	100%	100%

Source: database Oral Health of the Belgian Population 2008-2010¹⁶. Note: missing data were excluded.

^c healthy

^d based on anamnesis

^e based on anamnesis

^f evaluation by dentist not possible (“code 9”), e.g. limited mouth opening, tooth covered by orthodontic material



Table 1.2 –Status of third molars in a sample of the Belgian population per age category, average of the four mouth quadrants (See also Fig. 1.1).

AGE	5 to 15	16 to 24	25 to 34	35 to 44	45 to 54	55 to 65	>65 yrs	Total
	% age cat.	% age cat.	% age cat.	% age cat.	% age cat.	% age cat.	% age cat.	% all ages
<i>(% of all participants)</i>	<i>(9.6%)</i>	<i>(8.7%)</i>	<i>(8.4%)</i>	<i>(14.2%)</i>	<i>(16.6%)</i>	<i>(17.3%)</i>	<i>(25.2%)*</i>	<i>(100%)</i>
Sound ^g	0.7	23.5	33.8	26.2	17.7	10.6	3.7	14.4
Restored	0.0	1.0	8.3	14.3	16.1	11.4	4.3	8.6
Caries	0.3	0.6	3.5	3.4	2.0	1.6	1.0	1.7
Unerupted	62.0	30.4	10.9	5.4	3.0	1.8	1.3	11.4
Missing (caries ^h)	0.0	1.9	9.5	17.9	32.7	50.2	60.3	32.9
Missing (other ⁱ)	15.9	37.3	32.5	31.5	27.1	22.8	27.9	27.4
Evaluation not possible ^j	21.2	5.4	1.5	1.4	1.4	1.7	1.6	3.8
Total	100%	100%	100%	100%	100%	100%	100%	100%

Source: database Oral Health of the Belgian Population 2008-2010¹⁶/ *: persons >75 years of age deliberately overrepresented in sample. Note: Missing data were excluded

^g healthy

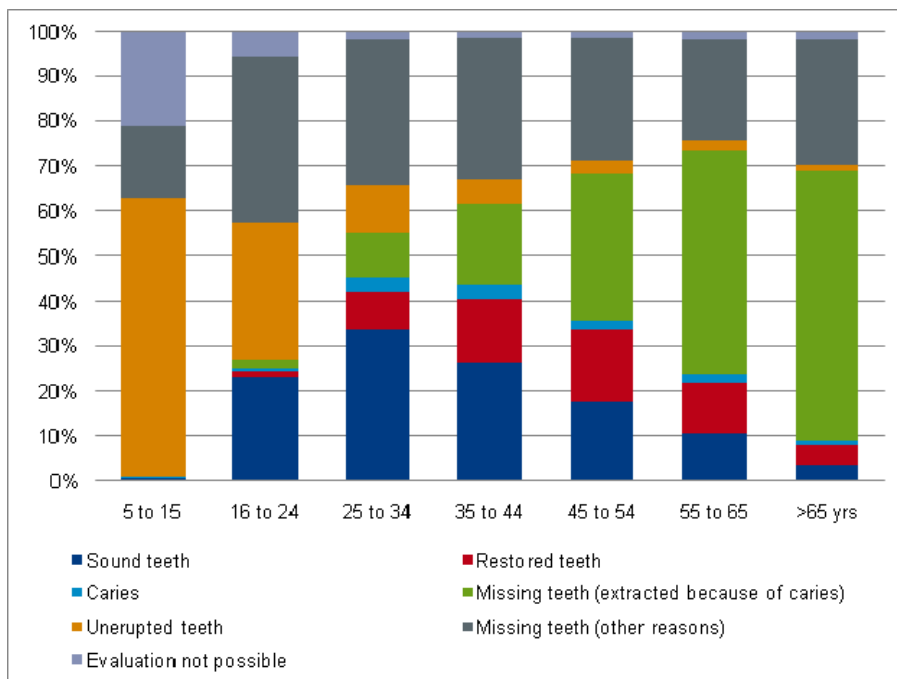
^h based on anamnesis

ⁱ based on anamnesis

^j evaluation by dentist not possible (“code 9”), e.g. limited mouth opening, tooth covered by orthodontic material



Figure 1.1 – Graphical representation of Table 1.2. Status of third molars in a sample of the Belgian population per age category, average of the four mouth quadrants.



Source: database Oral Health of the Belgian Population 2008-2010¹⁶/ Notes: persons >75 years of age deliberately overrepresented in sample; Missing data were excluded.

1.3 Scope of this report

This report aims to present the existing scientific evidence on the prophylactic extraction of third molars in the absence of local disease, and to formulate clinically relevant recommendations.

The following research questions were formulated:

- What are the benefits and risks (complications) of prophylactic extraction of pathology-free wisdom teeth (third molars) in adolescents and adults in the absence of local disease?
- What is the related good clinical practice for the prophylactic removal of pathology-free wisdom teeth?

The scope of this report targets adolescents and adults. Included are pathology-free third molars, whether they are erupted, impacted, unerupted or partially erupted. The report will not cover extractions of third molars associated with pathology. Both upper and lower third molars are included. However, the surgical removal of upper third molars is in general easier and associated with less postoperative morbidity than removal of lower third molars³.



2 METHODOLOGY

2.1 General approach

A systematic literature review was performed by searching for systematic reviews (including meta-analyses or not), randomized controlled trials and controlled clinical trials. The trials should compare the morbidity associated with retention, with the benefits of prophylactic removal and/or the surgical complications associated with it.

Additionally, existing guidelines of high quality were looked for, to facilitate the formulation of clinically relevant recommendations. However, full guideline development in the Belgian context was beyond the scope of this report.

Finally, after the report had been written and scientifically validated, but before its final approval by the Board of Directors (see colophon) and publication, a meeting was organized on May 25th, 2012, with Belgian stakeholders involved in the domain of wisdom tooth extraction. The stakeholders were invited to share their point of view and remarks. However, no changes could be made anymore to the content of the scientific part of the report, and the final responsibility for the recommendations remains with the KCE Board of Directors. A summary of this meeting can be found in Appendix 5.

2.2 Literature searches

2.2.1 Search strategy

2.2.1.1 Peer-reviewed databases

The search for peer-reviewed articles was focused on systematic reviews with or without meta-analyses, randomized controlled trials (RCT) and non-randomized clinical trials (CCT) comparing the effect of prophylactic removal of pathology-free wisdom teeth with no-treatment. Further, peer-reviewed databases were explored to find HTA reports and clinical practice guidelines (CPGs) as well.

Included databases were:

- Medline (PubMed),
- EMBASE,
- The Cochrane Database of Systematic Reviews,
- Database of abstracts of reviews of effects (DARE),
- The Centre for Reviews and Dissemination databases (CRD),
- HTA Database,
- NHS Economic Evaluation Database,
- Cochrane Central Register of Controlled Trials (CENTRAL),
- The Cochrane Oral Health Group Trials Register.

The search was limited to articles published in English, French, German and Dutch. There was no restriction as to publication date. All searches were run between December 2010 and March 2011. The search strings can be found in the Appendix 3.

Key journals were hand searched. An attempt was made to identify ongoing and unpublished trials.

The identified studies were selected based on title and abstract. For all eligible studies, the full-text was retrieved. In case no full-text was available, the study was not taken into account for the final recommendations.

2.2.1.2 Clinical practice guidelines

Specific websites were searched to identify additional international published CPGs on prophylactic removal of wisdom teeth (Table 2.1). A language (English, Dutch, French, German) and date restriction (2000 – 2010) were used.



Table 2.1 – Guideline websites and websites of professional associations.

Agency for Quality in Dentistry	http://www.zzq-koeln.de/english/aboutus.htm
AAOMS (American association of oral and maxillofacial surgery)	http://www.aaoms.org/
Clinical Research Centre of Ministry of Health, Malaysia	http://www.crc.gov.my/publication/guidelines.html
Clinical Evidence (BMJ Group)	http://group.bmj.com/products/evidence-centre/clinical-evidence
Guidelines International Network (GIN)	http://www.g-i-n.net/
Haute Autorité de Santé (HAS)	http://bfes.has-sante.fr/HTML/indexBFES_HAS.html
Scottish Intercollegiate Guidelines Network (SIGN)	http://www.sign.ac.uk/
National Guideline Clearinghouse	http://www.guideline.gov/
NHS National Library of Guidelines	http://www.evidence.nhs.uk/
National Health and Medical Research Council, Australian Government	http://www.nhmrc.gov.au/
National Institute for Health and Clinical Excellence (NICE)	http://www.nice.org.uk/
New Zealand Guidelines Group (NZGG)	http://www.nzgg.org.nz/
Royal College of Surgeons of England (Faculty of Dental Surgery)	http://www.rcseng.ac.uk/fds/publications-clinical-guidelines/clinical_guidelines

2.2.2 Quality appraisal

2.2.2.1 Systematic reviews, RCTs, CCTs

The quality of the retrieved systematic reviews was assessed using the checklists of the Dutch Cochrane Centre (www.cochrane.nl). Systematic reviews (SRs) found in peer-reviewed databases as well as in HTA documents or Clinical practice guidelines (CPGs) were taken into account. The quality of the retrieved RCTs and CCTs was also to be assessed using the checklists of the Dutch Cochrane Centre. All critical appraisals were done by a single KCE expert.

2.2.2.2 Clinical practice guidelines

The AGREE instrument (Appraisal of Guidelines, Research and Evaluation in Europe)^k was used to evaluate the methodological quality of the identified CPGs. An overview of the key elements of the AGREE instrument is presented in Appendix 4.2.2. Each of the identified CPGs was scored by two independent researchers (SS and ME) and discussed in case of disagreement. One of the prerequisites for a guideline to be included was that it should obtain a high score for the domain 'Rigour of development' (Domain III, see AGREE score in Appendix 4).

^k www.agreecollaboration.org



2.2.3 Data Extraction

For each systematic review and HTA report, the search date, publication year, searched databases, availability of evidence tables, included studies and main results were extracted.

For each included CPG the following data were extracted: search date and publication year, searched databases, availability of evidence tables, recommendations and referenced evidence.

The recommendations from the identified systematic reviews, HTA reports, and CPGs were summarized in evidence tables, and a level of evidence was assigned to each of them using the GRADE system (Grading of Recommendations Assessment, Development and Evaluation)¹. Evidence tables are provided in Appendix 4.

3 CURRENT KNOWLEDGE ABOUT PROPHYLACTIC REMOVAL OF PATHOLOGY-FREE THIRD MOLARS

3.1 Number of retrieved publications

3.1.1 Systematic reviews

After removal of duplicates, 4 systematic reviews (SRs) were retrieved^{5,11,17,18}. Two systematic reviews were excluded, due to the scope of the study (Luk 2010 focused on third molars exhibiting periodontal pathology)¹⁷, or due to a lack of methodological quality (Brauer 2009)¹⁸.

3.1.2 Health technology assessment reports

Two HTA reports were identified and selected. The first one was published by the Canadian Agency for Drugs and Technologies in Health (CADTH 2010¹⁰). It included four relevant systematic reviews (Song 2000¹¹, Mettes 2005⁵, Norwegian Knowledge Centre for Health Services 2003¹⁹, Dodson 2009²⁰), one retrospective non-randomized study with a treatment and a control group (Kunkel 2007)²¹ and two guidelines (NICE 2000¹⁵, the Agency for Quality in Dentistry 2006²²). The second HTA report was issued by the Regional HTA Centre of the Region Västra Götaland in Sweden (Suska et al. 2010¹⁴). It was based on two systematic reviews^{5,19}, 16 case series (each including more than 300 patients) and one review article on unusual complications.

¹ www.gradeworkinggroup.org



3.1.3 Clinical practice guidelines

From the search in the peer-reviewed databases and the website search, 10 CPGs were identified after removal of duplicates. In general, CPGs without references were excluded, as were CPGs without clear recommendations. Guidelines including systematic reviews that did not report the search strategy and/or the quality appraisal of the included studies were excluded (e.g. ANAES 1997⁴, SIGN 1999³, MoH Malaysia 2005²³). The remaining 7 CPGs were scored according to the AGREE system (see Appendix 4 for an overview of the scores). Based on an overall assessment, only one high-quality CPG was finally selected (see Appendix 4): the NICE Guideline (2000)¹⁵. The NICE Guideline was based on the systematic review written by Song et al. (2000) (see also 3.1.1)

3.1.4 RCTs or CCTs

After removal of duplicates, the search for RCTs or CCTs yielded 710 publications. These publications were sifted based on title and abstract; most publications were RCTs related to the postoperative use of different types of analgesics for which third molar removal since a long time has been used as a study model. Other publications dealt with specific surgical techniques used for third molar removal. Only one RCT dealt specifically with the prophylactic removal of third molars: Harradine 1998²⁴, already included in the reviews of Song et al. (2000)¹¹ and Mettes et al. (2005)⁵. To find ongoing clinical trials, a search in Clinicaltrials.gov (updated on January 25th, 2012) using the search terms (extraction OR extractions OR surgical OR surgery OR removal OR remove) AND (third molar OR third molars OR wisdom tooth OR wisdom teeth) identified 81 trials. None of them compared the removal with the retention of wisdom teeth.

3.1.5 Conclusion

As the systematic reviews authored by Song (2000) and by Mettes (2005) make up the same core of the evidence base of the HTA reports and the CPG and satisfied our quality criteria, we will describe their content and the conclusions drawn by their authors. Furthermore, conclusions and potential recommendations proposed in the CPG and the HTA reports, which also included large case series or non-randomized studies, will be reported.

It should be noted that four of these five publications explicitly focus on *impacted* wisdom teeth only. The HTA report from the Canadian Agency for Drugs and Technologies in Health (2010) is the only one that does not make this limitation.

3.2 Results: Systematic reviews

3.2.1 Song et al. (2000)

This systematic review¹¹ provided existing evidence on prophylactic removal of *impacted* wisdom teeth, in terms of the incidence of surgical complications associated with prophylactic removal, and the morbidity associated with retention. It was carried out to explore the clinical and cost-effectiveness of prophylactic wisdom tooth removal. Forty studies were included in the review: two RCTs^m, 34 literature reviews, and four decision analysis studies.

The two RCTs identified were published in 1998 and 1999, respectively, with one carried out in the UK and one in Denmark. The UK-based RCT (Harradine et al. 1998)²⁴, including 164 adolescents, compared the impact of wisdom tooth retention relative to prophylactic extraction on incisor crowding in patients who had previously undergone orthodontic treatment. Five years of follow-up were planned, with evaluation of outcomes based on comparison of baseline and follow-up measures (Little's Irregularity

^m one of these RCTs, Vondeling et al. 1999, has only been published as a conference proceeding, and therefore was not retrieved in the search for RCTs and CCTs performed in the current study. The authors have been contacted for the current study, but could not provide original data of the trial anymore, given the time that has elapsed since this RCT.



Index, intercanine width and arch length). **The results of this RCT suggested that the removal of third molars in adolescents to prevent late incisor crowding cannot be justified.** However, few data related to baseline characteristics of participants according to treatment arm and only 47% of recruited patients were available for data collection at the 5-year follow-up.

The second RCT (Vondeling et al. 1999)²⁵, carried out in Denmark, was not totally completed when Song et al. published their systematic review. At that moment, the trial recruited 200 participants (among 500 participants were planned to be enrolled). The study was planned to evaluate the clinical and cost-effectiveness of prophylactic third molar extraction, with extraction performed according to associated comorbidities (i.e. watchful waiting) in participants aged between 18 and 30 years. **Preliminary results of this RCT indicated that watchful waiting may be a beneficial management approach.** However, more data and longer follow-up of patients are needed to conclude which treatment strategy is the most cost-effective. Unfortunately, no further publications of the clinical or cost-effectiveness findings were found to report results obtained on the whole population of patients.

The 34 literature reviews, published between 1986 and 1999, included reviews, case reports, retrospective or prospective, cross-sectional or longitudinal observational studies. The methodological quality of the literature reviews was generally poor, and none of the reviews was systematic. It is impossible to judge the reliability of the evidence provided. **Nine reviews specifically addressed the association between third molars and crowding of the anterior teeth, suggesting that there was only a weak association between retention of third molars and anterior crowding.** Six out of 21 reviews with a more general scope also concluded that the prophylactic removal of third molars was unjustified. The conclusions reported by twelve general reviews about the management of third molars were definitely unclear. **The three reviews with a more general scope that suggested the appropriateness of prophylactic removal of third molars were of poorer methodological quality than the majority of other reviews.** Finally, four reviews focused specifically on the complications associated with third molar surgery. Three out of these four papers expressed uncertain conclusions relating to the prophylactic extraction of third molars.

Song et al. reported the difficulty to compare prophylactic removal of impacted third molars with retention in the absence of disease, due to the different outcomes related to both strategies. Four decision analyses used utility methods, allowing to compare different outcomes directly in the coherent models. These decision analyses systematically included frequencies of complications associated with retention and associated with prophylactic removal respectively; the numbers were mainly based on comprehensive literature reviews. To compare the different types of complications, ratings of severity by clinicians and/or by patients were used. **Findings of these decision-analyses consistently suggested that patients' well-being is maximized if surgical removal is confined to impacted third molars with pathological changes.** It was also suggested that, in the context of the UK, retention of third molars was cost-saving and more cost-effective compared with prophylactic removal of impacted third molars.



3.2.2 Mettes et al. (2005)

The Cochrane systematic review⁵ written by Mettes et al. in 2005 (and re-edited in 2008 with no change to conclusions) reported findings about the effectiveness of prophylactic removal of pathology-free *impacted* wisdom teeth in adolescents and adults compared with the retention of these wisdom teeth. Three relevant RCTs were identified by the authors, including one ongoing trial for which no results were reported nor later published. The two remaining completed RCTsⁿ assessed the influence of prophylactic removal on late incisor crowding in adolescents (14-17 years old).

One RCT was carried out in Sweden and used a split-mouth design to compare the impact of removal and retention, one of each side of the mouth, 3 years after the inclusion of 52 adolescents (Lindqvist 1982)²⁶. The quality level of this RCT was considered low (i.e. involving a high risk of bias) due to an unclear description of randomization, an inadequate allocation concealment, a lack of outcome assessor blinding, and withdrawals. Moreover, the outcomes were not reported by means of mean changes, standard deviations, p values or 95% confidence intervals were only reported as the calculated difference between the annual change on the extraction side and the change on the control side. **The authors of this RCT concluded that the benefits and harms of third molar removal were unclear, as orthodontic effects expressed as mean changes in arch length were comparable in both groups.**

The second RCT was conducted in UK, using a parallel-group design (Harradine 1998)²⁴. Results were already reported in Song et al. (2000) (see 3.2.1).

Although both completed trials met the inclusion criteria of the review, different outcomes measures were assessed which prevented pooling of data. A narrative review of study findings was thus provided. Authors concluded that no evidence was found to support or refute routine prophylactic removal of pathology-free impacted wisdom teeth in adults; **no studies of adults met the criteria for inclusion. There is some reliable evidence that suggests that the prophylactic removal of pathology-free impacted wisdom teeth in adolescents neither reduces nor prevents late incisor crowding.**

The authors recommended that adolescents and adults should be clearly informed about expected benefits and potential side-effects and complications of the prophylactic removal of pathology-free third molars. They recommended that dental clinicians and oral and maxillofacial surgeons focus on consistent clinical and radiological examination and diagnosis in all individuals from the age of about 18 years. According to the authors of this review, dental clinicians should be responsible for monitoring third molars in healthy individuals and to consult oral and maxillofacial surgeons for more complex cases; careful attention should be paid to the occurrence of pathology. Well-designed prospective research studies with longer follow-up are needed, as well as an additional exploration of decision analytic exercises including patient's views and preferences.

ⁿ the RCT by Lindqvist et al. 1982 was not retrieved in the search for RCTs and CCTs performed in the current study, because nowhere in this publication the word "RCT", "CCT", or an equivalent, was mentioned. In fact, it was a split mouth procedure, which in many other publications of later date (e.g. on the use of analgesics in third molar extractions) has been considered to be comparable to a RCT or CCT.

3.3 Results: Clinical Practice Guideline and HTA reports

3.3.1 NICE guideline (2000)

A brief guideline document¹⁵ was issued by NICE in 2000 regarding prophylactic removal of pathology-free *impacted* third molars. The guidance was mainly based upon the review by Song (2000)¹¹, and has been developed by a committee of 24 experts in health economics, epidemiology, public health, and surgery. The Faculty of Dental Surgery of the Royal College of Surgeons of England and The British Dental Association provided additional information and the Scottish Intercollegiate Guidelines Network provided a draft copy of their forthcoming guidelines.

According to the authors, there is no reliable research evidence to support a health benefit to patients from the prophylactic removal of pathology-free *impacted* third molar teeth. Available evidence suggests that retention may be more effective than prophylactic removal, at least in the short to medium term. It might also be more cost-effective (in the context of the UK). Patients who have impacted wisdom teeth that are not causing problems should visit their dentist for their usual check-ups.

According to the authors of the NICE guideline, recommendations for practice are:

- The practice of prophylactic removal of pathology-free impacted third molars should be discontinued.
- The standard routine programme of dental care by dental practitioners and/or paraprofessional staff, need be no different, in general, for pathology-free impacted third molars (those requiring no additional investigations or procedures).
- Surgical removal of (partially) impacted third molars should be limited to patients with evidence of pathology. Such pathology includes, according to the NICE guideline:
 - unrestorable caries (decay),
 - non-treatable pathology of the tooth root (non-treatable pulpal and/or periapical pathology),
 - cellulitis, abscess and osteomyelitis,
 - internal/external resorption of the tooth or adjacent teeth,

- fracture of tooth,
- disease of follicle including cyst/tumour,
- tooth/teeth impeding surgery or reconstructive jaw surgery,
- when a tooth is involved in or within the field of tumour resection.
- Specific attention is drawn to plaque formation and pericoronitis. Plaque formation is a risk factor but is not in itself an indication for surgery. The degree to which the severity or recurrence rate of pericoronitis should influence the decision for surgical removal of a third molar remains unclear. Pericoronitis refers to inflammation of the tissue surrounding a partially erupted third molar due to bacteria and debris collected under the overlying flap of tissue. The evidence suggests that a first episode of pericoronitis, unless particularly severe, should not be considered an indication for surgery. Second or subsequent episodes should be considered the appropriate indication for surgery.

Several recommendations for further research were given.

3.3.2 HTA report from The Canadian Agency for Drugs and Technologies in Health (2010)

This rapid review¹⁰ addressed the question of benefits and risks associated with the prophylactic extraction of pathology-free third molars; it is the only review that did not explicitly concentrate on *impacted* third molars only. Four systematic reviews (Song 2000¹¹, Mettes 2005⁵, Norwegian Knowledge Centre for Health Services 2003¹⁹, Dodson 2009²⁰), two CPGs (NICE 2000¹⁵, the Agency for Quality in Dentistry 2006²²) and one retrospective non-randomized study (Kunkel 2007)²¹ were included. **Findings suggested that there is insufficient evidence in terms of additional benefit or reduced future risk to recommend prophylactic wisdom tooth extraction.** Within the past ten years, limited comparative research exploring the benefits of prophylactic wisdom tooth extraction has been published. More studies providing evidence from direct comparisons of prophylactic removal versus watchful waiting are required in order for this practice to be justified, as current evidence is insufficient to promote this practice. Moreover, additional research using high quality methodology and longer follow-up are required to better address the research questions.



Patient preferences have also to be taken into account in order to prefer one strategy (extraction or not) on another.

Authors concluded that there is currently insufficient evidence supporting or refuting the practice of prophylactic removal of pathology-free third molars. Regarding clinical practice, deciding to remove pathology-free wisdom teeth has to be based on careful consideration of the potential risks and benefits for individual patients, as well as their attitude toward a potentially unnecessary surgical procedure.

3.3.3 HTA report from the Regional HTA Centre of the Region Västra Götaland in Sweden (2010)

In 2010, this HTA institution published a report¹⁴ aimed to give an answer to the following question ‘Does removal of third molar teeth reduce the risk of infections and other local disease/pathological conditions in subjects with asymptomatic or symptomatic *impacted* third molars compared with no intervention?’. The systematic literature search covering the period May 2003–december 2009 identified two systematic reviews (NOKC 2003, Mettes 2005), 16 studies that have reported the outcome following the extraction of third molar teeth, and one review article on unusual complications. All of the 16 studies were case series including more than 300 patients. The literature search did not find any additional randomized or non-randomized, adequately controlled trial in which prophylactic removal of third molar teeth has been compared with no intervention.

While the NOKC report¹⁹ stated that “removal of pathology-free fully retained wisdom teeth is not recommended”, the Cochrane review (Mettes 2005)⁵ concluded that “no evidence was found to support or refute routine prophylactic removal of pathology-free impacted wisdom teeth in adults.” All the case series reported adverse effects and complications. **Surgical removal of third molar teeth was associated with both short-term and long-term complications. The overall complication rate, including minor complaints, varied between 4.6 – 36%. The frequency of postoperative infections varied between 0.5 – 2.8%, and the frequency of nerve damages or sensory symptoms varied between 0.4 – 1.5%. The incidence of alveolitis or dry socket varied between 0.1 – 14.9%.**

This report also considered ethical and economical aspects of such prophylactic intervention. It concluded that exposing healthy pathology-free young people to an oral surgical procedure in order to prevent disease or a pathological condition that may occur in the future must be seriously questioned when there is no documented evidence of a beneficial effect. It is considered unethically to remove pathology-free fully retained wisdom teeth. The annual number of extractions of third molar teeth amounted 13 400 in 2009 in Sweden, for a population of about 9.3 million people. The major part of the costs have to be paid by patients themselves.

In conclusion, **prophylactic removal of third molar teeth to prevent possible future complications has been seriously questioned due to lack of supporting data of beneficial effects and the documented complications. The systematic literature search and review of published data has revealed that there is still no scientific documentation available to either support or refute routine prophylactic removal of pathology-free impacted wisdom teeth in adults.** No specific recommendation was formulated.

3.4 Discussion and conclusion

Given the fact that the prophylactic removal of pathology-free wisdom teeth is a current practice in many Western countries^{3,4,13-15}, the paucity of evidence of good quality in this domain is striking.

The larger part of the included literature focuses explicitly on fully or partially *impacted* wisdom teeth only, namely the available RCTs, the 2 retrieved systematic reviews, 1 of the 2 included HTAs, and the included CPG. This implies that the bulk of the evidence available in this review concerns the prophylactic removal of *impacted* wisdom teeth. On the other hand, the prophylactic extraction of erupted wisdom teeth has been little studied.



3.4.1 Methodological quality

No more than 3 RCTs²⁴⁻²⁶ are mentioned in the included systematic reviews, and the search for additional RCTs or CCTs of more recent date yielded no results. Two of these RCTs^{24,26} only address orthodontic outcomes after prophylactic removal of impacted wisdom teeth in adolescents; the overall quality can be considered to be low given the methodological shortcomings of these studies (see 3.2.1). The third RCT²⁵ addresses a broader range of indications and outcomes, but only preliminary results have been reported.

The methodological quality of the other publications included in the literature reviews and HTA reports was generally very low.

3.4.2 Literature review

The reviews included in Song (2000)¹¹ pertaining to prophylactic removal of pathology-free impacted wisdom teeth for orthodontic reasons are in line with the 2 RCTs included in the Cochrane review⁵, which state that the prophylactic removal in adolescents neither reduces nor prevents late incisor crowding, and that no publications of sufficient quality are available concerning removal for this indication in adults.

Song (2000) also discusses reviews with a more general scope dealing with all types of possible indications for prophylactic removal of impacted wisdom teeth. Whereas the larger majority of these reviews has no clear conclusions, some reviews concluded that prophylactic removal is unjustified but even so some of them suggest that prophylactic removal could be justified. However, Song (2000) noted that the latter were of poorer methodological quality than the majority of the other reviews. In line with this, the preliminary results of the RCT by Vondeling (1999)²⁵ indicated that watchful waiting might be a beneficial management approach. The two HTA reports^{10,14} concluded that there is still no scientific documentation available to either support or refute routine prophylactic removal of pathology-free wisdom teeth.

In fact, the basic question in this matter concerns the balance between the morbidity associated with retention and the benefits of prophylactic removal and/or the surgical complications associated with it. The literature reviews compared these two strategies globally and gave a general impression of the balance between them. However, only a decision analysis can approach this problem with a more fundamental scientific methodology. Song (2000) described 4 decision analyses, which systematically included frequencies of complications associated with retention and curative removal on the one hand and associated with prophylactic removal on the other hand. To compare the different types of complications, ratings of severity by clinicians and/or by patients were used. Findings consistently suggested that patients' well-being was maximized if surgical removal was confined to impacted third molars with pathological changes. It was also suggested that retention of third molars is cost-saving and more cost-effective (in the context of the UK) compared with prophylactic removal of impacted third molars.

Several of the included publications^{5,10} stressed the importance of clear communication with patients about expected benefits and potential side-effects and complications of the prophylactic removal of pathology-free third molars.

3.4.3 Conclusion

There is mostly little debate on the fact that third molars associated with clinical and/or radiological pathology should be removed. However, there is a lack of proven benefit from the systematic prophylactic removal of pathology-free third molars, impacted or not, in all adolescents or (young) adults, and the procedure is not free of risk. Preventive actions at the level of the population are only recommended if the benefits outweigh the disadvantages, and if this is not the case it is preferable not to intervene. If there is no scientific evidence that an intervention is beneficial, the largely accepted principle of medicine: "*primum non nocere*", "first, do no harm", should be respected.



■ APPENDICES

APPENDIX 1.

Appendix 1.1. NIHDI nomenclature (INAMI/RIZIV)

NIHDI nomenclature (Gray shade: codes not in use anymore)

NIHDI code	Start code	End code	Specialty	Label modified on	Label NL	Label FR	Cases 2010	NIHDI expenditures 2010
303015 - 303026	1/1/1989	1/15/1993	Tandheelkunde – Dentisterie (& Stomatologie)		Extractie van melktand(en) : één tand	Extraction de dent(s) lactéale(s) : une dent		
303030 - 303041	1/1/1989	1/15/1993	Tandheelkunde – Dentisterie (& Stomatologie)		Extractie van melktand(en) : per bijkomende tand, tijdens een zelfde zitting.	Extraction de dent(s) lactéale(s) : par dent supplémentaire au cours de la même séance		
303052 - 303063	1/1/1989	1/15/1993	Tandheelkunde – Dentisterie (& Stomatologie)		Behandeling van verwikking(en) na extractie van een tand, met of zonder hechting(en), tijdens dezelfde zitting of een latere zitting.	Traitement de complication(s) après extraction d'une dent avec ou sans suture(s), au cours de la même séance ou d'une séance ultérieure		
303096 - 303100	1/1/1989	1/15/1993	Tandheelkunde – Dentisterie (& Stomatologie)		Verwijderen (sectie met extractie) van wortel(s) : verscheidene wortels van dezelfde tand	Ablation (section et extraction) de racine(s) : de plusieurs racines de la même dent. L'intervention de l'assurance pour la prestation 303096 - 303100 n'est due que si un document radiographique transmis		



NIHDI code	Start code	End code	Specialty	Label modified on	Label NL	Label FR	Cases 2010	NIHDI expenditures 2010
						au médecin-conseil démontre la prestation effectuée		
303133 - 303144	4/1/1985	1/15/1993	Tandheelkunde – Dentisterie (& Stomatologie)	1/1/1989	Extractie van blijvende tand(en) : één tand.	Extraction de dent(s) définitive(s) : une dent.		
303155 - 303166	4/1/1985	1/15/1993	Tandheelkunde – Dentisterie (& Stomatologie)	1/1/1989	Extractie van blijvende tand(en) : per bijkomende tand, tijdens een zelfde zitting	Extraction de dent(s) définitive(s) : par dent supplémentaire au cours de la même séance		
303170 - 303181	4/1/1985	9/1/2005	Tandheelkunde – Dentisterie (& Stomatologie)	4/1/1999	Heelkundige extractie van een tand met resectie van omliggend bot en hechten van de ingesneden slijmvlieslappen : per tand	Extraction chirurgicale de dent avec résection de l'os environnant et suture des lambeaux muqueux incisés : par dent		
303214 - 303225	1/15/1993	9/1/2005	Tandheelkunde – Dentisterie (& Stomatologie)	4/1/1999	Heelkundige extractie van een tand met resectie van omliggend bot en hechten van de ingesneden slijmvlieslappen : per bijkomende tand uitgevoerd onder de voorwaarden voorzien in artikel 6, § 3, 1ste alinea	Extraction chirurgicale de dent avec résection de l'os environnant et suture des lambeaux muqueux incisés : par dent supplémentaire, effectuée dans les conditions prévues à l'article 6, § 3, alinéa 1er		
304732 - 304743	1/15/1993	7/1/2008	Tandheelkunde – Dentisterie (& Stomatologie)	9/1/2005	Verwijderen (sectie met extractie) van wortel(s) bij een rechthebbende, vanaf de 18de	Ablation (section et extraction) de racine(s), chez le bénéficiaire, à partir du 18e		



NIHDI code	Start code	End code	Specialty	Label modified on	Label NL	Label FR	Cases 2010	NIHDI expenditures 2010
					verjaardag : verscheidene wortels van dezelfde tand	anniversaire : de plusieurs racines de la même dent		
304776 - 304780	1/15/1993		Tandheelkunde – Dentisterie (& Stomatologie)	7/1/2008	Verwijderen (sectie met extractie) van wortel(s) bij een rechthebbende, vanaf de 15de verjaardag : verscheidene wortels van dezelfde tand	Ablation (section et extraction) de racine(s), chez le bénéficiaire à partir du 15e anniversaire : de plusieurs racines de la même dent		
304776 - 304780	1/15/1993		Tandheelkunde – Dentisterie (& Stomatologie)	5/1/2009	Verwijderen (sectie met extractie) van wortel(s) bij een rechthebbende, vanaf de 18e verjaardag: verscheidene wortels van dezelfde tand	Ablation (section et extraction) de racine(s), chez le bénéficiaire à partir du 18e anniversaire : de plusieurs racines de la même dent	10 354	€ 340 400
304813 - 304824	2/1/2005	6/1/2007	Tandheelkunde – Dentisterie (& Stomatologie)	9/1/2005	Extractie van blijvende tanden bij een kind, vanaf de 12de tot de 14de verjaardag, per tand	Extraction de dents définitives chez un enfant à partir du 12e anniversaire jusqu'au 14e anniversaire, par dent		
304850 - 304861	6/1/2007		Tandheelkunde – Dentisterie (& Stomatologie)	7/1/2008	Extractie van een tand, vanaf de 60ste verjaardag	Extraction d'une dent à partir du 60e anniversaire		
304850 - 304861	6/1/2007		Tandheelkunde – Dentisterie (& Stomatologie)	6/1/2010	Extractie van een tand, vanaf de 55e verjaardag	Extraction d'une dent à partir du 55e anniversaire	626 392	€ 16 905 035
304872 - 304883	6/1/2007		Tandheelkunde – Dentisterie (&	6/1/2010	Extractie van een tand, vanaf de 55e	Extraction d'une dent à partir du 55e	260 228	€ 5 008 628



NIHDI code	Start code	End code	Specialty	Label modified on	Label NL	Label FR	Cases 2010	NIHDI expenditures 2010
			Stomatologie)		verjaardag, per bijkomende tand in hetzelfde kwadrant en in dezelfde zitting	anniversaire, par dent supplémentaire dans le même quadrant et au cours de la même séance		
304872 - 304883	6/1/2007		Tandheelkunde – Dentisterie (& Stomatologie)	7/1/2008	Extractie van een tand, vanaf de 60ste verjaardag, per bijkomende tand in hetzelfde kwadrant en in dezelfde zitting	Extraction d'une dent à partir du 60e anniversaire, par dent supplémentaire dans le même quadrant et au cours de la même séance		
304894 - 304905	6/1/2007		Tandheelkunde – Dentisterie (& Stomatologie)	7/1/2008	Extractie van een tand, vanaf de 15de tot de 60ste verjaardag, in geval de rechthebbende beantwoordt aan één van de voorwaarden van het artikel 6, § 3bis	Extraction d'une dent à partir du 15e anniversaire jusqu'au 60e anniversaire, dans le cas où le bénéficiaire répond à une des conditions de l'article 6, § 3 bis		
304894 - 304905	6/1/2007		Tandheelkunde – Dentisterie (& Stomatologie)	5/1/2009	Extractie van een tand, vanaf de 18e tot de 60ste verjaardag, in	Extraction d'une dent à partir du 18e anniversaire jusqu'au		

^o De verzekeringstegemoetkoming voor de verstrekkingen 304894-304905 en 304916-304920 is enkel verschuldigd als de tandextractie gebeurt in één van de volgende omstandigheden : 1) ten gevolge van een osteomyelitis, een radionecrose, een chemotherapie, een behandeling met ionisatie- of immunodepressieagens; 2) met het oog op een mondsanering in het kader van een radiotherapie in het hoofd- of halsgebied, een chemotherapie, een openhartoperatie, een orgaantransplantatie, een behandeling met ionisatie- of immunodepressieagens; 3) ten gevolge van de onmogelijkheid voor de rechthebbende om een correcte mondhygiëne te verwerven of te behouden zonder de hulp van derden, wegens een blijvende handicap. Het invoeren van een van deze tegemoetkomingsvoorwaarden behoort tot de verantwoordelijkheid van de tandheeskundige. De motivering hiervan wordt door de tandheeskundige opgenomen en bewaard in het dossier van de rechthebbende, en daarenboven bevestigd : - voor het punt 1) door een attest van de geneesheer die de aandoening behandelde. - voor het punt 2) door een schriftelijk verzoek tot mondsanering vanwege de geneesheer die de pathologie behandelt. Deze elementen kunnen door de adviserend geneesheer ter inzage worden opgevraagd."



NIHDI code	Start code	End code	Specialty	Label modified on	Label NL	Label FR	Cases 2010	NIHDI expenditures 2010
					geval de rechthebbende beantwoordt aan één van de voorwaarden van het artikel 6, § 3bis	60e anniversaire, dans le cas où le bénéficiaire répond à une des conditions de l'article 6, § 3 bis		
304894 - 304905	6/1/2007		Tandheelkunde – Dentisterie (& Stomatologie)	6/1/2010	Extractie van een tand, vanaf de 18e tot de 55e verjaardag, in geval de rechthebbende beantwoordt aan één van de voorwaarden van het artikel 6, § 3bis	Extraction d'une dent à partir du 18e anniversaire jusqu'au 55e anniversaire, dans le cas où le bénéficiaire répond à une des conditions de l'article 6, § 3 bis	16 614	€ 465 344
304916 - 304920	6/1/2007		Tandheelkunde – Dentisterie (& Stomatologie)	6/1/2010	Extractie van een tand, vanaf de 18e tot de 55e verjaardag, in geval de rechthebbende beantwoordt aan één van de voorwaarden van het artikel 6, § 3bis, per bijkomende tand in hetzelfde kwadrant en in dezelfde zitting	Extraction d'une dent à partir du 18e anniversaire jusqu'au 55e anniversaire, dans le cas où le bénéficiaire répond à une des conditions de l'article 6, § 3 bis, par dent supplémentaire dans le même quadrant et au cours de la même séance	9012	€ 184 322
304916 - 304920	6/1/2007		Tandheelkunde – Dentisterie (& Stomatologie)	5/1/2009	Extractie van een tand, vanaf de 18e tot de 60ste verjaardag, in geval de rechthebbende beantwoordt aan één van de voorwaarden van het artikel 6, § 3bis,	Extraction d'une dent à partir du 18e anniversaire jusqu'au 60e anniversaire, dans le cas où le bénéficiaire répond à une des conditions de l'article 6,		



NIHDI code	Start code	End code	Specialty	Label modified on	Label NL	Label FR	Cases 2010	NIHDI expenditures 2010
					per bijkomende tand in hetzelfde kwadrant en in dezelfde zitting	§ 3 bis, par dent supplémentaire dans le même quadrant et au cours de la même séance		
304916 - 304920	6/1/2007		Tandheelkunde – Dentisterie (& Stomatologie)	7/1/2008	Extractie van een tand, vanaf de 15de tot de 60ste verjaardag, in geval de rechthebbende beantwoordt aan één van de voorwaarden van het artikel 6, § 3bis, per bijkomende tand in hetzelfde kwadrant en in dezelfde zitting	Extraction d'une dent à partir du 15e anniversaire jusqu'au 60e anniversaire, dans le cas où le bénéficiaire répond à une des conditions de l'article 6, § 3 bis, par dent supplémentaire dans le même quadrant et au cours de la même séance		
304931 - 304942	5/1/2009		Tandheelkunde – Dentisterie (& Stomatologie)		Bijkomend honorarium voor wondhechting na tandextractie(s) of verwijderen van wortel(s) (sectie met extractie), vanaf de 18e verjaardag	Honoraires complémentaires pour suture de plaie après extraction(s) dentaire(s) ou ablation (section et extraction) de racine(s), à partir du 18e anniversaire	86724	€ 1 107 649
304953 - 304964	5/1/2009		Tandheelkunde – Dentisterie (& Stomatologie)		Bijkomend honorarium voor wondhechting na tandextractie(s) of verwijderen van wortel(s) (sectie met extractie), in hetzelfde kwadrant per	Honoraires complémentaires pour suture de plaie après extraction(s) dentaire(s) ou ablation (section et extraction) de racine(s), par dent supplémentaire	42153	€ 363 535



NIHDI code	Start code	End code	Specialty	Label modified on	Label NL	Label FR	Cases 2010	NIHDI expenditures 2010
					bijkomende tand en gedurende dezelfde zitting, vanaf de 18e verjaardag	dans le même quadrant et durant la même séance, à partir du 18e anniversaire		
312152 - 312163	4/1/1985	2/1/2004	Stomatologie	1/1/1995	Desinclusie en extractie van een geïmpacteerde of geretineerde tand door pericoronaire beenderresectie en/of tand-osteotomie, al dan niet met voorafgaande trepanatie	Désinclusion et extraction d'une dent incluse par résection osseuse péricoronaire et/ou ostéotomie dentaire avec ou sans trépanation préalable		
312410*^p - 312421*	2/1/2004		Stomatologie		Osteotomie rond een geretineerde tand waarbij een pericoronaire botresectie en desgevallend een tandsectie wordt uitgevoerd	Ostéotomie autour d'une dent incluse par résection osseuse péricoronaire et, le cas échéant, lorsqu'une section dentaire est effectuée	103364	€ 14 438 149
312432* - 312443*	2/1/2004		Stomatologie		Osteotomie boven en rond een tandkiem met eventuele tandsectie met verwijdering van de tandkiem	Ostéotomie au-dessus et autour d'un germe dentaire avec section dentaire éventuelle et enlèvement du germe dentaire	52946	€ 6 758 069
317214* - 317225*	4/1/1985		Stomatologie (& Tandheelkunde)		Extractie onder algemene anesthesie van minimum 8 tanden,	Extraction sous anesthésie générale, de 8 dents au moins, y	515	€ 88 971

^p for the nomenclature numbers with (*), there is no obligation to mention the number of the extracted tooth to the sickness fund in order to obtain reimbursement (see also scientific report chapter 1.2.2)



NIHDI code	Start code	End code	Specialty	Label modified on	Label NL	Label FR	Cases 2010	NIHDI expenditures 2010
			– Dentisterie)		inclusief alveolectomie en eventuele hechtingen	compris l'alvéolectomie et les sutures éventuelles		
317236 - 317240	4/1/1985		Stomatologie (& Tandheelkunde – Dentisterie)		Extractie van geïmpacteerte of geretineerde tand	Extraction de dent incluse	37171	€ 2 633 571
317251 - 317262	4/1/1985		Stomatologie (& Tandheelkunde – Dentisterie)	10/1/1995	Extractie onder algemene anesthesie van minder dan 8 tanden, inclusief alveolectomie en eventuele hechtingen	Extraction, sous anesthésie générale, de moins de 8 dents, y compris l'alvéolectomie et les sutures éventuelles	2014	€ 174 513
317376* - 317380*	2/1/2004		Stomatologie		Extractie in ziekenhuismilieu van minimum 8 tanden, inclusief alveolectomie en eventuele hechtingen onder monitoring van de vitale parameters	Extraction en milieu hospitalier de minimum 8 dents, y compris l'alvéolectomie et les sutures éventuelles, et ce sous monitoring des paramètres vitaux	137	€ 26 906
317391* - 317402*	2/1/2004		Stomatologie		Extractie in ziekenhuismilieu van minder dan 8 tanden, inclusief alveolectomie en eventuele hechtingen, en dit onder monitoring van de vitale parameters	Extraction en milieu hospitalier de moins de 8 dents, y compris l'alvéolectomie et les sutures éventuelles, et ce sous monitoring des paramètres vitaux	229	€ 22 383
374776 - 374780	9/1/2005		Tandheelkunde – Dentisterie (& Stomatologie)	7/1/2008	Verwijderen (sectie met extractie) van wortel(s), bij een rechthebbende, tot de 15de verjaardag :	Ablation (section et extraction) de racine(s), chez le bénéficiaire jusqu'au 15e		



NIHDI code	Start code	End code	Specialty	Label modified on	Label NL	Label FR	Cases 2010	NIHDI expenditures 2010
					verscheidene wortels van dezelfde tand	anniversaire : de plusieurs racines de la même dent		
374776 - 374780	9/1/2005		Tandheelkunde – Dentisterie (& Stomatologie)	5/1/2009	Verwijderen (sectie met extractie) van wortel(s), bij een rechthebbende, tot de 18e verjaardag : verscheidene wortels van dezelfde tand	Ablation (section et extraction) de racine(s), chez le bénéficiaire jusqu'au 18e anniversaire : de plusieurs racines de la même dent	472	€ 19 524
374813 - 374824	9/1/2005	6/1/2007	Tandheelkunde – Dentisterie (& Stomatologie)		Extractie van blijvende tanden bij een kind tot de 12de verjaardag, per tand	Extraction de dents définitives chez un enfant jusqu'au 12e anniversaire, par dent		
374835 - 374846	9/1/2005	6/1/2007	Tandheelkunde – Dentisterie (& Stomatologie)		Extractie van melkmolaren bij een kind tot de 12de verjaardag, per tand	Extraction de molaires lactéales chez un enfant jusqu'au 12e anniversaire, par dent		
374850 - 374861	6/1/2007		Tandheelkunde – Dentisterie (& Stomatologie)	7/1/2008	Extractie van een melkchoektand, een melkmolaar of een blijvende tand, tot de 15de verjaardag	Extraction d'une canine lactéale, d'une molaire lactéale ou d'une dent définitive, jusqu'au 15e anniversaire		
374850 - 374861	6/1/2007		Tandheelkunde – Dentisterie (& Stomatologie)	5/1/2009	Extractie van een melkchoektand, een melkmolaar of een blijvende tand, tot de 18e verjaardag	Extraction d'une canine lactéale, d'une molaire lactéale ou d'une dent définitive, jusqu'au 18e anniversaire	342 824	€ 11 436 705
374872 - 374883	6/1/2007		Tandheelkunde – Dentisterie (& Stomatologie)	7/1/2008	Extractie van een melkchoektand, een melkmolaar of een	Extraction d'une canine lactéale, d'une molaire lactéale ou d'une dent		



NIHDI code	Start code	End code	Specialty	Label modified on	Label NL	Label FR	Cases 2010	NIHDI expenditures 2010
					blijvende tand, tot de 15de verjaardag, per bijkomende tand in hetzelfde kwadrant en in dezelfde zitting	définitive jusqu'au 15e anniversaire, par dent supplémentaire dans le même quadrant et au cours de la même séance		
374872 - 374883	6/1/2007		Tandheelkunde – Dentisterie (& Stomatologie)	5/1/2009	Extractie van een melkchoektand, een melkmolaar of een blijvende tand, tot de 18e verjaardag, per bijkomende tand in hetzelfde kwadrant en in dezelfde zitting	Extraction d'une canine lactéale, d'une molaire lactéale ou d'une dent définitive jusqu'au 18e anniversaire, par dent supplémentaire dans le même quadrant et au cours de la même séance	40 590	€ 957 494
374931 - 374942	5/1/2009		Tandheelkunde – Dentisterie (& Stomatologie)		Bijkomend honorarium voor wondhechting na tandextractie(s) of verwijderen van wortel(s) (sectie met extractie), tot de 18e verjaardag	Honoraires complémentaires pour suture de plaie après extraction(s) dentaire(s) ou ablation (section et extraction) de racine(s), jusqu'au 18e anniversaire	14 459	€ 228 254
374953 - 374964	5/1/2009		Tandheelkunde – Dentisterie (& Stomatologie)		Bijkomend honorarium voor wondhechting na tandextractie(s) of verwijderen van wortel(s) (sectie met extractie), in hetzelfde kwadrant per bijkomende tand en gedurende dezelfde	Honoraires complémentaires pour suture de plaie après extraction(s) dentaire(s) ou ablation (section et extraction) de racine(s), par dent supplémentaire dans le même quadrant et durant la même	2 825	€ 29 750



NIHDI code	Start code	End code	Specialty	Label modified on	Label NL	Label FR	Cases 2010	NIHDI expenditures 2010
201235 - 201246	4/1/1985		Anesthesie- Anesthésie		zitting, tot de 18e verjaardag	séance, jusqu'au 18e anniversaire	1 744	€ 223 725
					Algemene anesthesie bij extractie van ten minste acht tanden, met of zonder alveolotomie, met of zonder conserverende tandverzorging	Anesthésie générale lors d'extraction de 8 dents au moins, avec ou sans alvéolotomie, avec ou sans soins dentaires conservateurs		
201250 - 201261	4/1/1985		Anesthesie- Anesthésie		Algemene anesthesie bij extractie van minder dan acht tanden met of zonder alveolotomie en/of conserverende tandverzorging	Anesthésie générale lors d'extraction de moins de 8 dents avec ou sans alvéolotomie, et/ou soins dentaires conservateurs	9 313	€ 575 769



APPENDIX 2.

Appendix 2.1. GRADE system: Levels of evidence

Quality level	Definition	Methodological Quality of Supporting Evidence
High (A)	We are very confident that the true effect lies close to that of the estimate of the effect	RCTs without important limitations or overwhelming evidence from observational studies
Moderate (B)	We are moderately confident in the effect estimate: the true effect is likely to be close to the estimate of the effect, but there is a possibility that it is substantially different	RCTs with important limitations (inconsistent results, methodological flaws, indirect, or imprecise) or exceptionally strong evidence from observational studies
Low (C)	Our confidence in the effect estimate is limited: the true effect may be substantially different from the estimate of the effect	RCTs with very important limitations or observational studies or case series
Very low (D)	We have very little confidence in the effect estimate: the true effect is likely to be substantially different from the estimate of the effect	



Appendix 2.2. AGREE Instrument (version II)

Key elements of appraisal (source and further information: <http://www.agreetrust.org/>)

AGREE II

Domain 1. Scope and Purpose

The overall objective(s) of the guideline is (are) specifically described.

The health question(s) covered by the guideline is (are) specifically described.

The population (patients, public, etc.) to whom the guideline is meant to apply is specifically described.

Domain 2. Stakeholder Involvement

The guideline development group includes individuals from all the relevant professional groups.

The views and preferences of the target population (patients, public, etc.) have been sought.

The target users of the guideline are clearly defined.

Domain 3. Rigour of Development

Systematic methods were used to search for evidence.

The criteria for selecting the evidence are clearly described.

The strengths and limitations of the body of evidence are clearly described.

The methods for formulating the recommendations are clearly described.

The health benefits, side effects, and risks have been considered in formulating the recommendations.

There is an explicit link between the recommendations and the supporting evidence.

The guideline has been externally reviewed by experts prior to its publication.

A procedure for updating the guideline is provided.

Domain 4. Clarity of Presentation

The recommendations are specific and unambiguous.

The different options for management of the condition or health issue are clearly presented.

Key recommendations are easily identifiable.



Domain 5. Applicability

The guideline describes facilitators and barriers to its application.

The guideline provides advice and/or tools on how the recommendations can be put into practice.

The potential resource implications of applying the recommendations have been considered.

The guideline presents monitoring and/ or auditing criteria.

Domain 6. Editorial Independence

The views of the funding body have not influenced the content of the guideline.

Competing interests of guideline development group members have been recorded and addressed.



APPENDIX 3.

Appendix 3.1. Pubmed Search Strategy: guidelines, systematic reviews, meta-analyses

Author	Team
Project number	GCP
Project name	Removal of wisdom teeth in the absence of local disease
Search questions	Extraction of third molars
Keywords	("Molar, Third"[Mesh] OR wisdom tooth OR wisdom teeth) AND ("Tooth Extraction"[Mesh] OR tooth extract* OR teeth extract* OR tooth removal OR teeth removal)
Date	22-12-2010
Database	PubMed Medline
Search Strategy	("Molar, Third"[Mesh] OR ("molar, third"[MeSH Terms] OR ("molar"[All Fields] AND "third"[All Fields]) OR "third molar"[All Fields] OR ("wisdom"[All Fields] AND "tooth"[All Fields]) OR "wisdom tooth"[All Fields]) OR ("molar, third"[MeSH Terms] OR ("molar"[All Fields] AND "third"[All Fields]) OR "third molar"[All Fields] OR ("wisdom"[All Fields] AND "teeth"[All Fields]) OR "wisdom teeth"[All Fields])) AND ("Tooth Extraction"[Mesh] OR (tooth extraction[All Fields] OR tooth extraction/classification[All Fields] OR tooth extraction/complications[All Fields] OR tooth extraction/contraindications[All Fields] OR tooth extraction/economics[All Fields] OR tooth extraction/ethics[All Fields] OR tooth extraction/history[All Fields] OR tooth extraction/instrumentation[All Fields] OR tooth extraction/methods[All Fields] OR tooth extraction/mortality[All Fields] OR tooth extraction/nonextraction[All Fields] OR tooth extraction/nursing[All Fields] OR tooth extraction/psychology[All Fields] OR tooth extraction/rehabilitation[All Fields] OR tooth extraction/standards[All Fields] OR tooth extraction/trends[All Fields] OR tooth extraction/utilization[All Fields] OR tooth extraction/veterinary[All Fields] OR tooth extractions[All Fields] OR tooth extracts[All Fields]) OR (teeth extracted[All Fields] OR teeth extraction[All Fields] OR teeth extraction/complications[All Fields] OR teeth extraction/experimental[All Fields] OR teeth extraction/hemorrhage[All Fields] OR teeth extraction/history[All Fields] OR teeth extraction/statistics[All Fields] OR teeth extraction/veterinary[All Fields] OR teeth extractions[All Fields]) OR (("tooth"[MeSH Terms] OR "tooth"[All Fields]) AND removal[All Fields]) OR (("tooth"[MeSH Terms] OR "tooth"[All Fields] OR "teeth"[All Fields]) AND removal[All Fields])) AND ("humans"[MeSH Terms] AND (Meta-Analysis[ptyp] OR Practice Guideline[ptyp] OR Review[ptyp]) AND (English[lang] OR French[lang] OR German[lang] OR Dutch[lang]))
Note	156 papers found



Appendix 3.2. Embase Search Strategy: guidelines, systematic reviews, meta-analyses

Author	Team	
Project number	GCP	
Project name	Removal of wisdom teeth in the absence of local disease	
Search questions	Extraction of third molars	
Keywords	Third molar, extraction, practice guideline	
Date	09-02-2011	
Database	Embase	
Search Strategy	#12. #10 AND [embase]/lim	36
	#11. #8 AND [embase]/lim	16
	#10. #7 AND #9	72
	#9. 'practice guideline'/exp OR 'practice guideline'	234 664
	#8. #7 AND ([cochrane review]/lim OR [meta analysis]/lim OR [systematic review]/lim) AND ([article]/lim OR [review]/lim) AND ([dutch]/lim OR [english]/lim OR [french]/lim OR [german]/lim)	29
	#7. #1 AND #6	4 886
	#6. #2 OR #5	28 132
	#5. #3 AND #4	28 132
	#4. 'extraction'/exp OR 'extraction' OR 'removal'	472 824
	#3. 'tooth'/exp OR 'tooth' OR 'teeth'/exp OR 'teeth'	474 314
	#2. 'tooth extraction'/exp	14 873
	#1. 'molar tooth'/exp OR 'molar teeth' OR 'third molar'/exp OR 'third molars' OR 'third molar tooth'/exp OR 'third molar teeth' OR 'wisdom tooth'/exp OR 'wisdom teeth' OR (molar* AND third)	23 652
Note	36 references found for guidelines and 16 references found for meta-analyses/reviews	



Appendix 3.3. Pubmed Search Strategy: RCT and CCT

Author	Team
Project number	GCP
Project name	Removal of wisdom teeth in the absence of local disease
Search questions	Extraction of third molars
Keywords	("Molar, Third"[Mesh] OR wisdom tooth OR wisdom teeth) AND ("Tooth Extraction"[Mesh] OR tooth extract* OR teeth extract* OR tooth removal OR teeth removal)
Date	22-12-2010
Database	PubMed Medline
Search Strategy	("Molar, Third"[Mesh] OR ("molar, third"[MeSH Terms] OR ("molar"[All Fields] AND "third"[All Fields]) OR "third molar"[All Fields] OR ("wisdom"[All Fields] AND "tooth"[All Fields]) OR "wisdom tooth"[All Fields] OR ("molar, third"[MeSH Terms] OR ("molar"[All Fields] AND "third"[All Fields]) OR "third molar"[All Fields] OR ("wisdom"[All Fields] AND "teeth"[All Fields]) OR "wisdom teeth"[All Fields])) AND ("Tooth Extraction"[Mesh] OR (tooth extraction[All Fields] OR tooth extraction/classification[All Fields] OR tooth extraction/complications[All Fields] OR tooth extraction/contraindications[All Fields] OR tooth extraction/economics[All Fields] OR tooth extraction/ethics[All Fields] OR tooth extraction/history[All Fields] OR tooth extraction/instrumentation[All Fields] OR tooth extraction/methods[All Fields] OR tooth extraction/mortality[All Fields] OR tooth extraction/nonextraction[All Fields] OR tooth extraction/nursing[All Fields] OR tooth extraction/psychology[All Fields] OR tooth extraction/rehabilitation[All Fields] OR tooth extraction/standards[All Fields] OR tooth extraction/trends[All Fields] OR tooth extraction/utilization[All Fields] OR tooth extraction/veterinary[All Fields] OR tooth extractions[All Fields] OR tooth extracts[All Fields]) OR (teeth extracted[All Fields] OR teeth extraction[All Fields] OR teeth extraction/complications[All Fields] OR teeth extraction/experimental[All Fields] OR teeth extraction/hemorrhage[All Fields] OR teeth extraction/history[All Fields] OR teeth extraction/statistics[All Fields] OR teeth extraction/veterinary[All Fields] OR teeth extractions[All Fields]) OR (("tooth"[MeSH Terms] OR "tooth"[All Fields]) AND removal[All Fields]) OR (("tooth"[MeSH Terms] OR "tooth"[All Fields] OR "teeth"[All Fields]) AND removal[All Fields])) AND ("humans"[MeSH Terms] AND (Randomized Controlled Trial[ptyp] OR Clinical Trial, Phase III[ptyp] OR Controlled Clinical Trial[ptyp]) AND (English[lang] OR French[lang] OR German[lang] OR Dutch[lang]))
Note	598 papers found



Appendix 3.4. Embase Search Strategy: RCT and CCT

Author	Team	
Project number	GCP	
Project name	Removal of wisdom teeth in the absence of local disease	
Search questions	Extraction of third molars	
Keywords	Third molar, extraction, RCT, CCT	
Date	09-02-2011	
Database	Embase	
Search Strategy	#9. #8 AND [embase]/lim	284
	#8. #7 AND ([controlled clinical trial]/lim OR [randomized controlled trial]/lim) AND [article]/lim AND ([dutch]/lim OR [english]/lim OR [french]/lim OR [german]/lim)	563
	#7. #1 AND #6	4 886
	#6. #2 OR #5	28 132
	#5. #3 AND #4	28 132
	#4. 'extraction'/exp OR 'extraction' OR 'removal'	472 824
	#3. 'tooth'/exp OR 'tooth' OR 'teeth'/exp OR 'teeth'	474 314
	#2. 'tooth extraction'/exp	14 873
	#1. 'molar tooth'/exp OR 'molar teeth' OR 'third molar'/exp OR 'third molars' OR 'third molar tooth'/exp OR 'third molar teeth' OR 'wisdom tooth'/exp OR 'wisdom teeth' OR (molar* AND third)	23 652
Note	284 references found	

Appendix 3.5. Other search strategies

The following databases were searched by the keywords “third molar OR third molars”:

- the Cochrane Database of Systematic Reviews,
- Database of abstracts of reviews of effects (DARE),
- the Centre for Reviews and Dissemination (CRD),
- HTA Database,
- NHS Economic Evaluation Database,
- Cochrane Central Register of controlled Trials (CENTRAL),
- the Cochrane Oral Health Group Trials Register.



APPENDIX 4.

Appendix 4.1. Identified guidelines and their quality appraisal (AGREE score)

Source	Title	Standardised Score#						Overall quality	Final Appraisal
		I	II	III	IV	V	VI		
Faculty of Dental Surgery - The Royal College of Surgeons of England 1997¹²	The management of patients with third molar (syn: wisdom) teeth	33.3%	16.7%	17.7%	80.6%	0%	37.5%	1.5/7	Not recommended
NICE 2000¹⁵	Guidance of the extraction of wisdom teeth	66.7%	8.3%	72.9%	66.7%	77.1%	87.5%	5.5/7	Recommended
American Academy of Paediatric Dentistry (AAPD) 2010²⁷	Clinical guideline on adolescent oral health care	14%	8.5%	14%	3.5%	4.5%	2%	1/7	Not recommended
American Academy of Paediatric Dentistry (AAPD) 2005²⁸	Clinical guideline on paediatric oral surgery	12.5%	6%	19%	8%	7%	7.5%	2/7	Not recommended
Agency for Quality in Dentistry (ZZQ, Germany) 2006²²	Surgical removal of third molars	80.6%	55.6%	28.1%	47.2%	0%	0%	2.5/7	Not recommended
NGC-7156 HealthPartners Dental Group 2008⁷	HealthPartners Dental Group and Clinics third molar guideline	77.8%	33.3%	19.8%	38.9%	10.4%	4.2%	2/7	Not recommended
Clinical Evidence 2010 (based on Dodson and Susarla 2009)²⁰	Impacted wisdom teeth	88.9%	0%	19.8%	38.9%	0%	0%	2/7	Not recommended



Appendix 4.2. Identified systematic reviews and their quality appraisal (Dutch Cochrane evaluation)

Reference of review	Song 2000	Search date			
Intervention	Prophylactic removal of impacted wisdom teeth	1999			
Comparator	Retention				
Name of appraiser	SAS				
		Ja	Nee	±	?
Methoden					
1. Is de vraagstelling adequaat geformuleerd?		x			
2. Is de zoekactie adequaat uitgevoerd?		x			
3. Is de selectieprocedure van artikelen adequaat uitgevoerd?		x			
4. Is de kwaliteitsbeoordeling adequaat uitgevoerd?		x			
5. Is adequaat beschreven hoe data-extractie heeft plaatsgevonden?		x			
6. Zijn de belangrijkste kenmerken van de oorspronkelijke onderzoeken beschreven?		x			
7. Is adequaat omgegaan met klinische en statistische heterogeniteit van de onderzoeken?					NA
8. Is statistische pooling op een correcte manier uitgevoerd?					NA
Algemeen oordeel					
9. Zijn de resultaten van de systematische review valide en toepasbaar?		x			



Reference of review	Mettes 2005	Search date			
Intervention	Prophylactic removal of asymptomatic impacted WT	August 2004			
Comparator	Retention				
Name of appraiser	SAS				
		Ja	Nee	±	?
Methoden					
1. Is de vraagstelling adequaat geformuleerd?		x			
2. Is de zoekactie adequaat uitgevoerd?		x			
3. Is de selectieprocedure van artikelen adequaat uitgevoerd?		x			
4. Is de kwaliteitsbeoordeling adequaat uitgevoerd?		x			
5. Is adequaat beschreven hoe data-extractie heeft plaatsgevonden?		x			
6. Zijn de belangrijkste kenmerken van de oorspronkelijke onderzoeken beschreven?		x			
7. Is adequaat omgegaan met klinische en statistische heterogeniteit van de onderzoeken?		x			
8. Is statistische pooling op een correcte manier uitgevoerd?		NA			
Algemeen oordeel					
9. Zijn de resultaten van de systematische review valide en toepasbaar?		x			



Reference of review	Brauer 2009	Search date			
Intervention	Complications associated with surgery	2008			
Comparator					
Name of appraiser	SAS				
		Ja	Nee	±	?
Methoden					
1. Is de vraagstelling adequaat geformuleerd?			x		
2. Is de zoekactie adequaat uitgevoerd?			x		
3. Is de selectieprocedure van artikelen adequaat uitgevoerd?			x		
4. Is de kwaliteitsbeoordeling adequaat uitgevoerd?			x		
5. Is adequaat beschreven hoe data-extractie heeft plaatsgevonden?			x		
6. Zijn de belangrijkste kenmerken van de oorspronkelijke onderzoeken beschreven?			x		
7. Is adequaat omgegaan met klinische en statistische heterogeniteit van de onderzoeken?			x		
8. Is statistische pooling op een correcte manier uitgevoerd?					
Algemeen oordeel					
9. Zijn de resultaten van de systematische review valide en toepasbaar?			x		



Reference of review	Luk 2010	Search date			
Intervention	prophylactic extraction of asymptomatic erupted third molars in relation to periodontal pathology	February 2010			
Comparator	non-extraction				
Name of appraiser	SAS				
		Ja	Nee	±	?
Methoden					
1. Is de vraagstelling adequaat geformuleerd?		x			
2. Is de zoekactie adequaat uitgevoerd?				x	
3. Is de selectieprocedure van artikelen adequaat uitgevoerd?			x		
4. Is de kwaliteitsbeoordeling adequaat uitgevoerd?		x			
5. Is adequaat beschreven hoe data-extractie heeft plaatsgevonden?		x			
6. Zijn de belangrijkste kenmerken van de oorspronkelijke onderzoeken beschreven?		x			
7. Is adequaat omgegaan met klinische en statistische heterogeniteit van de onderzoeken?					NA
8. Is statistische pooling op een correcte manier uitgevoerd?					NA
Algemeen oordeel					
9. Zijn de resultaten van de systematische review valide en toepasbaar?			x		

Comment: The population investigated is out of scope: retained asymptomatic third molars exhibiting periodontal pathology in the third molar region



Appendix 4.3. Evidence tables

Appendix 4.3.1. Clinical practice guideline

CPG ID	Search date	Population	Recommendation	Supporting evidence	Comments	Level of evidence
NICE 2000 ¹⁵	1999	<p>Population: people with unerupted or impacted third molars, or those undergoing surgical removal of third molars either as prophylaxis or due to associated pathological changes</p> <p>Intervention: prophylactic removal of impacted wisdom teeth</p> <p>Comparator: Retention</p> <p>Outcomes: pathological changes associated with retention of third molars, or post-operative</p>	<p>Prophylactic removal of pathology-free impacted third molars should be discontinued.</p> <p>The standard routine program of dental care has to be no different, in general, for pathology free impacted third molars (requiring no additional investigations or procedures).</p> <p>Surgical removal of impacted third molars should be limited to patients with evidence of pathology, including unrestorable caries, non-treatable pulpal and/or periapical pathology, cellulitis, abscess and osteomyelitis, internal/external resorption of the tooth or adjacent teeth, fracture of tooth, disease of follicle including cyst/tumour, tooth/teeth impeding surgery or reconstructive jaw surgery, and when a tooth is involved in or within the field of tumour resection.</p> <p>Specific attention is drawn to plaque formation and pericoronitis.</p> <p>Plaque formation is not an indication for surgery.</p>	<p>2 RCTs</p> <ul style="list-style-type: none"> - Harradine et al. 1998 - Vondeling et al. 1999 <p><i>Results from the RCTs:</i></p> <ul style="list-style-type: none"> - one RCT found that removal of third molars to prevent late incisor crowding cannot be justified - one RCT is a preliminary report and indicate that watchful waiting may be a promising strategy <p>34 Reviews</p> <ul style="list-style-type: none"> - Anderson 1998 - Bertrand et al. 1989 - Bishara 1999 - Bonetti et al. 1988 - Bramante 1990 - Brokaw 1991 - Cade 1992 - Chikhani et al. 1994 - Daley 1996 - Dénes et al. 1993 - ECRI 1993 	<p>This CPG is based on a systematic review of Song 2000</p> <p><i>Searched databases:</i> Medline (1984-99), EMBASE (1984-99), Science Citation Index, Cochrane Controlled Trials Register, National Research Register; DARE; paper sources and web-based resources. Relevant agencies were also contacted.</p> <p><i>Quality Assessment of Studies:</i></p> <ul style="list-style-type: none"> • RCTs assessed based on reporting of selection criteria, sample size, a priori power calculation, mode of randomization, group comparability, blinded outcome evaluation, withdrawals, appropriateness of analysis, intention to treat analysis. 	Very low



complications following extraction.

A first episode of pericoronitis, unless particularly severe, should not be considered an indication for surgery.

Second or subsequent episodes should be considered the appropriate indication for surgery.

- Flick 1999
- Forssell & Miettinen 1988
- Garatini et al. 1990
- Goia et al. 1990
- Jacquiéry, et al. 1994
- Kugelberg 1992
- Lechien 1995
- Mercier & Precious 1992
- Mommaerts et al. 1991
- Peterson 1992
- Robinson 1994
- Robinson & Vasir 1993
- Sands et al. 1993
- Southard 1992
- Stephens et al. 1989
- Tate 1994
- Tealdi & Domini 1986
- Torres 1997
- Toth 1993
- van der Linden, et al. 1993
- Vasir & Robinson 1991
- Waite & Reynolds 1998
- Weisenfeld & Kondis 1991

Results from literature reviews:

- 9 reviews reported only a weak association between retention of

- Literature reviews assessed based on clarity of review goals, literature search, selection criteria, presentation of primary study findings, methods of summarizing data.

Harradine: Random allocation; no ITT analysis; no reported power calculation for sample size; assessors were blinded. There are few data relating to baseline characteristics of participants according to treatment arm. Only 47% of recruited patients were available for data collection at the 5-year follow-up

Vondeling: no description of the method of randomisation, but participants were allocated according to a blocked and stratified scheme. No information was given about baseline characteristics of study groups. Descriptive results only.

Narrative reviews: poor



-
- | | |
|---|--|
| <p>third molars and crowding</p> <ul style="list-style-type: none">- 6 of 21 reviews concluded that prophylactic removal was unjustified- 12 reviews had no clear conclusions- 3 reviews suggested that prophylactic removal is appropriate | <p>methodological quality of the literature reviews ; none was a systematic review. It is impossible to judge the reliability of the evidence provided.</p> <p>Literature reported in these reviews included reviews, case reports, retrospective or prospective, cross-sectional or longitudinal observational studies.</p> |
|---|--|
-



Appendix 4.3.2. HTA reports

CPG ID Ref	Search date	Population	Recommendation	Supporting evidence	Comments	Level of evidence
CADTH 2010¹⁰	2010	<p>P: individuals having asymptomatic wisdom teeth</p> <p>I: third molar removal</p> <p>C: third molar retention</p> <p>O: clinical benefit</p>	<p>There is currently insufficient evidence supporting or refuting the practice of prophylactic removal of asymptomatic third molars.</p> <p>Regarding clinical practice, the decision to remove asymptomatic wisdom teeth appears to be best based on careful consideration by practitioners of the potential risks and benefits for individual patients, as well as their attitude toward a potentially unnecessary surgical procedure.</p>	<p>4 SR:</p> <ul style="list-style-type: none"> - Song 2000 - Mettes 2008 - Norwegian Knowledge Centre for Health Services (NOKC) 2003 - Dodson and Susarla 2009 <p>1 non randomized study:</p> <ul style="list-style-type: none"> - Kunkel et al. 2007 <p>2 CPGs:</p> <ul style="list-style-type: none"> - NICE 2000 - Agency for Quality in Dentistry 2006 	<p>Limited literature search conducted on PubMed, EBSCOhost: CINAHL, The Cochrane Library (Issue 7, 2010), CRD databases, ECRI (Health Devices Gold), EuroScan, international HTA agencies and a focused Internet search.</p> <p>HTA, systematic reviews (with or without meta-analyses), RCTs and non-randomized studies were eligible for inclusion</p>	Very low
HTA Centre Sweden Suska 2010¹⁴	2009	<p>P1: Healthy individuals of all ages with totally or partially impacted wisdom teeth without symptoms</p> <p>P2: Healthy individuals of all ages with totally or partially impacted wisdom teeth with any</p>	<p>Prophylactic removal of third molar teeth to prevent possible future complications is seriously questioned due to lack of supporting data of beneficial effects and the documented complications.</p> <p>There is still no scientific documentation available to either support or refute routine prophylactic removal of asymptomatic impacted wisdom teeth in adults.</p>	<p>2 SR:</p> <ul style="list-style-type: none"> - NOKC 2003 - Mettes 2005 <p>16 case series:</p> <ul style="list-style-type: none"> - Benediktsdottir 2004 - Blondeau 2007 - Bui 2003 - Chuang 2008 - Contar 2009 	<p>Literature searches were performed in PubMed, The Cochrane Library, CINAHL, EMBASE and a number of HTA-databases</p> <p>Quality appraisal of systematic reviews used the AMSTAR checklists</p> <p>Ethical and economical aspects were also</p>	Very low



kind of symptom or condition (i.e. pain, pus, swelling, increased laboratory parameters, trismus, dysphagia, pericoronitis, crowding, or cysts)

I: Extraction of third molar tooth

C: No extraction or any other treatment of third molar tooth

O: Primary outcome variable: Infection

Secondary outcome variables: Root resorption, crowding, caries on adjacent tooth, loss of adjacent tooth, complications related to the surgical procedure

- Del-Rey-Santamaria 2006
- Di Dio 2004
- Figueiredo 2005
- Halpern 2003
- Haug 2005
- Huang 2006
- Jerjes 2006
- Queral-Godoy 2006
- Queral-Godoy 2005
- Rothamel 2006
- Waite 2006

considered

From these 16 case series, the overall complication rate varied between 4.6 – 36%. The frequency of postoperative infections varied between 0.5 – 2.8%, and the frequency of nerve damages or symptoms varied between 0.4 – 1.5%.



Appendix 4.3.3. Systematic reviews

Study ID	Method	Patient characteristics	Intervention(s)	Results primary outcomes	Critical appraisal of review quality
<p>Mettes 2005⁵</p> <p>Update without changes in 2008</p>	<ul style="list-style-type: none"> Design: SR Sources of funding: not reported (no conflict of interest) Search date: 2004 (+ update in 2008) Searched databases: Cochrane Oral Health Trials Register (4 August 2004), Cochrane Register of Controlled Trials, Medline (1966-2004), Pubmed (1966-2004) Included study designs: randomized or controlled clinical trials Number of included studies: 3 trials <ul style="list-style-type: none"> 2 completed RCTs: Lindqvist 1982, Harradine 1998 1 ongoing RCT: van de Waal 1999 	<ul style="list-style-type: none"> Population: adolescents or adults with asymptomatic impacted wisdom teeth, and participants in the same category undergoing prophylactic removal of asymptomatic wisdom teeth. Outcomes: pathologic changes (pericoronitis, caries, cysts, tumours, root resorption, crowding), post-operative complications, costs 	<ul style="list-style-type: none"> Intervention: prophylactic removal of asymptomatic impacted wisdom teeth Control: no treatment (retention) 	<p>Harradine 1998 (n=164, mean age 14 years and 10 months ± 16.2 months)</p> <p>77 individuals completed the trial (44 vs. 33)</p> <p><i>Little's index of irregularity (LII):</i> 0.80mm±1.23 in IG vs. 1.1±2.72 in CG (p=0.55)</p> <p><i>Inter canine width (ICW):</i> -0.37±0.73 vs. -0.38±0.85 (p=0.92)</p> <p><i>Little's index of arch length (AL):</i> -1.1±1.13 vs. -2.13±0.97 (p=0.001)</p> <p>Following the restriction of the studied population to only those having no residual spacing on entry to the study (IG: n=36; CG:n=18): no significant change in LII (p=0.15) and ICW (p=0.52) but AL remained significant (p=0.0035)</p> <p>All changes were not significant for the upper arch.</p> <p>Conclusion: No evidence was found to support or refute routine prophylactic removal of asymptomatic impacted wisdom teeth in adults. There is some reliable evidence that suggests that the prophylactic removal of asymptomatic</p>	<p><i>Quality Assessment of Studies:</i></p> <p>Grading of allocation concealment, blinding of outcome assessors, completeness of patient follow-up; studies categorized according to perceived risk of bias (low, moderate, high)</p> <ul style="list-style-type: none"> - Harradine 1998: Grade A - Lindqvist 1982: Grade C



impacted wisdom teeth in adolescents
neither reduces nor prevents late
incisor crowding.

***Lindqvist 1982 (n=52 individuals with
unerupted third molars; mean age 15
years and 6 months, range 13 to 19;
split-mouth design)***

Arch length

Increased in some participants and
decreased in others – no significant
change on the extraction side
compared with the control side of the
same patient – but significant change
on both sides

Difference varied between -0.4 mm and
0.8 mm (mean change: 0.16 mm)
during an observation period of at least
3 years.

Not description of mean changes,
standard deviations, p values and
confidence intervals.



Appendix 4.4. Stakeholder meeting

A stakeholder meeting has been organized on May 25th 2012, to discuss the validated draft of the report and a preliminary version of the recommendations. The stakeholders were invited to share their point of view and remarks. However, no changes could be made anymore to the

content of the scientific part of the report, and the final responsibility for the recommendations remains with the KCE Board of Directors.

The following stakeholder organizations were invited and/or participated at the meeting and/or sent their written comments:

Type of organisation	Name	Invited	Participated	Written comments
Association of Dutch-speaking dentists	Verbond der Vlaamse Tandartsen	Yes	Yes	No
Association of French-speaking dentists	Société de Médecine Dentaire	Yes	Yes	No
Royal Belgian society of oral and maxillofacial surgeons (French speaking part)	Société Royale Belge de Stomatologie et de chirurgie Maxillo-Faciale/ Koninklijke Belgische Vereniging voor Stomatologie en Maxillo-Faciale Heelkunde	Yes	Yes	No
Belgian professional organisation of oral and maxillofacial surgeons (Dutch speaking part)	Belgische beroepsvereniging van geneesheren specialisten in de stomatologie, mond-, kaak-, en aangezichtschirurgie/ Union professionnelle des médecins belges spécialistes en stomatologie et chirurgie orale et maxillo-faciale	Yes	Yes	No
National institute for health and disability insurance	RIZIV/INAMI	Yes	Yes	Yes
Private insurance company	DKV (Assurance complémentaire)	Yes	No	No
Association of Flemish patient organisations	Vlaams Patiëntenplatform	Yes	No	Yes
Association of French patient organisations	Ligue des usagers des services de santé (LUSS)	Yes	No	No
Consumer organisation	Test-Aankoop/Test Achats	Yes	Yes	Yes



The association of Flemish patient organizations and/or the consumer organization mentioned the following points:

- Every intervention should be performed with the aim to improve or retain the patient's health, and patient's rights as described in the Belgian law of 22 August 2002 should be respected.
- The communication between professional and patient is very important. Together they take the decision on the intervention. A patient can only give his/her consent, if (s)he has been well-informed.
- This implies that the patient has the right to know all aspects that are necessary to understand his/her health status. This includes, among other, information on the intervention, side-effects and possible complications of the intervention, possible alternatives, consequences of not undergoing the intervention, financial aspects, etc. The patient has also the right to diagnostic or therapeutic programmes tailored as much as possible to his/her personal needs.
- In case of minors, the professional should evaluate if the minor is able to give his/her consent. If (s)he is able to do so, his/her consent should be asked.

The professional organizations mentioned the following points:

- The report does not emphasize enough the developmental process of the third molar roots between the age of 15 and 25 years. Because at this age the roots are not yet fully developed, it causes much less complications to remove the tooth than at a later age. Moreover, due to the specific attitudes and behaviours of young people between the age of +/-20 and 30 years, who feel less concerned by (costly) preventive strategies, many of them frequent dentists much less than before and therefore it is better to do the extraction before that age.
- The report also does not emphasize enough the implications of a watchful follow-up (frequent radiographies etc), nor the possible burden of treatment of pathologies and complications at a later age (more antibiotics, difficult surgery etc.) in case the teeth are not removed at an early age when they are still pathology-free.
- The current situation is different as compared to e.g. 20 years ago. At that time, many people had teeth removed at a young age for different

reasons including caries. Nowadays, more young people in their twenties have a complete and healthy set of teeth.

- The report starts from a wrong presumption. From a certain age onwards (e.g. 18 years, depending on the speed of maturation), a pathology-free unerupted third molar does not exist anymore, because a tooth is not made to stay unerupted. In fact, from that age onwards, every unerupted wisdom tooth is a pathology.
- The current way of practice is as follows:
 - Only part of the dentists are convinced of the need to remove unerupted pathology-free wisdom teeth, and they refer their patients to the oral and maxillofacial surgeons.
 - The surgeons leave erupted pathology-free wisdom teeth in place.
 - Also, after the age of +/-35 years, unerupted pathology-free wisdom teeth are left in place.
 - However, unerupted pathology-free wisdom teeth in young people, ideally before the age of 18 years and depending on the speed of maturation, are all removed.
- The professional organisations look at the concept of "prevention" at the level of an individual patient; the KCE looks at the concept of "prevention" at the level of the whole population. The participating organisations of oral and maxillofacial surgeons also recognized that they are more concerned by the second level of care, after the patient has been referred by his/her dentist. Consequently, they do not see patients coming from the global population but only a pre-selected sample.
- According to the professional organisations, the ideal future scenario would be that everybody who has pathology-free unerupted wisdom teeth has them removed before the age of about 18 years, taking into consideration the speed of maturation for each individual patient. This would be a preventive action at the population-level, as it is now the case for e.g. vaccinations.



- The conclusions of the KCE are too strong and unidirectional. Because there is insufficient scientific documentation of good quality, it is not possible to either support or reject prophylactic removal of pathology-free wisdom teeth. Therefore it is not possible to recommend against systematic prophylactic removal of pathology-free wisdom teeth, as the KCE does.
- The report correctly insists on the need to inform patients.
- The reason why there are few scientific studies might be:
 - this type of large and long-term epidemiological studies are difficult to perform;
 - follow-up of patients is difficult because patient can easily change from one dentist to another;
 - funding for this type of studies is difficult to find (no sponsoring by commercial companies).
- If there is no scientific evidence that an intervention is beneficial, the KCE so far never has recommended this intervention in his reports. This is in line with the largely accepted principle of medicine: “primum non nocere”, “first, do no harm”.

The KCE replied:

- The report does include possible pathologies and complications at a later age, or the implications of a watchful follow-up. These aspects are dealt with in the described decision-analyses (report paragraph 3.2.1). These decision analysis models compare prophylactic with symptomatic extraction for impacted third molars, including frequencies and ratings of severity of complications in both cases. Although based on evidence of low quality, these analyses consistently suggest that patients' well-being is maximized if surgical removal is confined to wisdom teeth with pathological changes.
- Even if every unerupted pathology-free wisdom tooth from a certain age onwards would be considered to be a pathology because it did not erupt, this does not mean that a treatment is absolutely necessary. Preventive actions at the level of the population are only recommended if the benefits outweigh the disadvantages, and it can be preferable not to intervene. This principle is commonly used in medicine, e.g. to decide on the usefulness of PSA-screening (prostate specific antigen) as a means to detect and provide early treatment for prostate cancer.



■ REFERENCES

1. Garcia RI, Chauncey HH. The eruption of third molars in adults: a 10-year longitudinal study. *Oral Surg Oral Med Oral Pathol.* 1989;68(1):9-13.
2. Hugoson A, Kugelberg CF. The prevalence of third molars in a Swedish population. An epidemiological study. *Community Dent Health.* 1988;5(2):121-38.
3. Scottish Intercollegiate Guidelines Network. Management of unerupted and impacted third molar teeth - A national clinical guideline. Edinburgh: 1999. SIGN 43
4. Agence Nationale d'Accréditation et d'Evaluation en Santé. Indications et non-indications de l'avulsion des troisièmes molaires mandibulaires. Paris: ANAES; 1997.
5. Mettes TG, Nienhuijs ME, van der Sanden WJ, Verdonchot EH, Plasschaert AJ. Interventions for treating asymptomatic impacted wisdom teeth in adolescents and adults. *Cochrane Database Syst Rev.* 2005(2):CD003879.
6. Kandasamy S, Rinchuse DJ. The wisdom behind third molar extractions. *Aust Dent J.* 2009;54(4):284-92.
7. HealthPartners. HealthPartners Dental Group and Clinics third molar guideline. Minneapolis: HealthPartners; 2008.
8. Kandasamy S. Evaluation and management of asymptomatic third molars: Watchful monitoring is a low-risk alternative to extraction. *American journal of orthodontics and dentofacial orthopedics : official publication of the American Association of Orthodontists, its constituent societies, and the American Board of Orthodontics.* 2011;140(1):11-7.
9. White RP, Jr., Proffit WR. Evaluation and management of asymptomatic third molars: Lack of symptoms does not equate to lack of pathology. *American journal of orthodontics and dentofacial orthopedics : official publication of the American Association of Orthodontists, its constituent societies, and the American Board of Orthodontics.* 2011;140(1):10-6.
10. Canadian Agency for Drugs and Technologies in Health. Prophylactic Removal of Wisdom Teeth: A Review of the Clinical Benefit and Guidelines. Health Technology Inquiry Service; 2010.



11. Song F, O'Meara S, Wilson P, Golder S, Kleijnen J. The effectiveness and cost-effectiveness of prophylactic removal of wisdom teeth. York: NHS Centre for Reviews and Dissemination; 2000.
12. The Royal College of Surgeons of England. The management of patients with third molar (syn: wisdom) teeth. London: Faculty of Dental Surgery RCS; 1997. Current clinical practice and parameters of care.
13. Friedman JW. The prophylactic extraction of third molars: a public health hazard. *American journal of public health*. 2007;97(9):1554-9.
14. Suska F, Kjeller G, Molander A, Samuelsson O, Svanberg T, Liljegren A. Removal of impacted wisdom teeth. Göteborg: Sahlgrenska Universitetssjukhuset; 2010. HTA Rapport 2010:30
15. National Institute for Clinical Excellence. Guidance on the Extraction of Wisdom Teeth. London: National Institute for Clinical Excellence; 2000. Technology Appraisal Guidance 1
16. Bottenberg P, Carvalho J, Declerck D, Declerck K, De Vos E, Vanden Abbeele A, et al. Data Registration and Evaluation of the Oral Health of the Belgian Population 2008-2010. June 2011. Available from:
www.ice.ugent.be
<http://www.riziv.fgov.be/information/nl/studies/study53/index.htm>
<http://www.inami.fgov.be/information/fr/studies/study53/index.htm>
17. Luk B, Kashigar A, Pallan S, Patel A, Tour A. Prophylactic extraction of asymptomatic third molars to prevent periodontal pathology: an evidence based study. Toronto: University of Toronto, Faculty of Dentistry; 2010.
18. Brauer H. Unusual complications associated with third molar surgery: A systematic review. *Quintessence International*. 2009;40(7):565-72.
19. Norwegian Knowledge Centre for the Health Services. Prophylactic removal of wisdom teeth. Oslo: Norwegian Knowledge Centre for the Health Services (NOKC); 2003. [SMM-rapport Nr. 10/2003]
20. Dodson TB, Susarla SM. Impacted wisdom teeth. *Clin Evid* (Online), 2010.
21. Kunkel M, Kleis W, Morbach T, Wagner W. Severe third molar complications including death-lessons from 100 cases requiring hospitalization. *J Oral Maxillofac Surg*. 2007;65(9):1700-6.
22. Agency for Quality in Dentistry (ZZQ). Surgical removal of third molars. Köln: Institute of German Dentists; 2006.
23. Ministry of Health Malaysia (MoH). Management of unerupted and impacted third molar teeth. Putrajaya: Ministry of Health Malaysia; 2005. Clinical Practice Guidelines MOH/P/PAK/107.05 (GU)
24. Harradine N, Pearson M, Toth B. The effect of extraction of third molars on late lower incisor crowding: a randomized controlled trial. *Br J Orthod* 1998;25:117-22.
25. Vondeling H, Maningky M, Bezemer D, Smeele LE, Baart JA, van der Waal I. Issues in the design and preliminary results of a randomized controlled trial comparing the effects and costs of preventive removal of third molars versus removal on indication. In: Proceedings of 15th Annual Meeting of the ISTAHC; 1999; Edinburgh, Scotland.
26. Lindqvist B, Thilander B. Extraction of third molars in cases of anticipated crowding in the lower jaw. *Am J Orthod*. 1982;81(130-9).
27. American Academy of Pediatric Dentistry (AAPD). Clinical guideline on adolescent oral health care. Chicago: American Academy of Pediatric Dentistry (AAPD); 2010.
28. American Academy of Pediatric Dentistry (AAPD). Clinical guideline on pediatric oral surgery. Chicago American Academy of Pediatric Dentistry (AAPD); 2010.

