Age determination in asylum seekers: physicians should not be implicated (In my view a verb “involve” should be used. Throoughout the manuscript the verb “involve” is being used)

Pieter J.J. Sauer 1
Alf Nicholson 2
David Neubauer 3

On behalf of the Advocacy and Ethics Group of the European Academy of Paediatrics.

1. Department of Paediatrics, Beatrix Children Hospital/UMCG, Groningen, the Netherlands
2. Department of Paediatrics, Children’s University Hospital, Dublin 1, Ireland
3. Department of Child, Adolescent and Developmental Neurology, University Children’s Hospital, Ljubljana, Slovenia
Correspondence to P.J.J. Sauer, Department of Paediatrics, Beatrix Children Hospital/UMCG, Hanzeplein 1 9700RB Groningen, The Netherlands
Phone +31-50-3612430
Fax +31-50-3611704
p.j.j.sauer@umcg.nl

key words: asylum seekers, age determination, bone age, ethics, puberty

word count 2311

Abstract.

Paediatricians and other physicians are asked by legal authorities to help making the decision if an asylum seeker is a minor, defined as a person below the age of 18, or an adult. X/rays are often used for this purpose.

None of the present available methods can accurately determine the age of an adolescent in a normal population and certainly not in refugees who might have either an advanced or delayed maturation due to circumstances during their growth. There are also important ethical reasons why physicians should not be involved in this practice. Finally, a physician can not be forced by legal authorities to be involved in this practice.

Based on ethical, medical and legal arguments, advises (Who is advising? The European Academy of Paediatrics, the paper or the authors? This formulation is ambiguous. Mind the use of singular/plural.) the European Academy of

Paediatrics all paediatricians in Europe not to be involved in age determination of individuals during the asylum and refugee status determination procedure.

Introduction

Every year asylum seekers come to Europe. Around four percent of these are, according to their testimony, minors. Because the regulations for admitting or refusing to enter the European countries are different for minors and adults, governments eager (eager as a verb?) to ascertain the age of the asylum seekers who testify to be minor. The help of physicians is sought to determine the age of these individuals. A proven identity is the key that unlocks the door to participation in society. Date of birth and chronological age but also biological age are determinants of how individuals can participate in, or are treated by, the society in which they live.

The fact that evidence of age is fundamental to the realization of rights and needs in society is recognized in Article 7 of the United Nations Convention on the Rights of the Child, which states that *"The child shall be registered immediately after birth".*[1] Unfortunately, it has been estimated that around 51 million births go unregistered each year in developing countries, mainly in South Asia and sub-Saharan Africa.[2] Even when a birth has been registered, the individual may lose the documentation and have no way of replacing it, particularly in times of upheaval such as war and social unrest. (Comment: I advise to refer to the most recent data contained in the 2013 UNICEF's report *Every Child's Birth Right: Inequities and trends in birth registration* and to expand a reference to a situation of losing the documentation to children without identification documents being issued. I propose the following text: **Unfortunately, it has been estimated that globally, the births of nearly 230 million children under age five have never been recorded. In 2012 alone, 57 million infants – four out of every ten babies delivered worldwide that year – were not registered with civil authorities. The lowest levels of birth registration are found in sub-Saharan Africa and South Asia.2 Even when a birth has been registered, registered child may not have a proof of registration (an identification document such as a birth certificate) or the individual may lose the documentation and have no way of replacing it, particularly in times of upheaval such as war and social unrest.)** The unfortunate geographical coincidences of incomplete birth registration rates, wars and poverty mean that refugees and asylum seekers may often possess no evidence of age. Worldwide there were in 2008 approximately 827,000 asylum seekers, 44% of whom were children.**3** Unaccompanied or separated children have made 4% of all asylum claims (Comment. Children do not form asylum claims). **(**Comment: UNHCR 2012 *Global trends* was released in which significant raise in asylum requests is indicated – should be consulted to have more recent data to refer to.) Age is a key determinant of how an individual is handled in such circumstances and may be the deciding factor in the success or failure of an asylum application. For children, it also defines access to education and health care.

Three important aspects must be considered regarding age determination in minor asylum seekers. (This statement implies that the asylum seeker is underage –minor and thus contradicts with the need to determine age. The sentence could be reworded as follows: **Three important aspects must be considered regarding age determination in cases when a child's age of an**

asylum seeker is in doubt.)

1. **Ethical questions**.

Is there any justification that physicians be involved in the age determination in case of uncertainty, whether the individual is a minor, when there is no medical reason to perform an investigation? (Comment: The same as above.) Is this dependent on the reliability and invasiveness of the test? Is consent of the individual needed, and will consent be given freely, without any pressure? What will the position of the undetermined minor be when he/she refuses consent for any procedure? Does the physician undermine the confidentiality of the patient – doctor relationship by giving his/her opinion to the legal authorities ?

2. **Medical questions**.

Are there methods that reliably can estimate the age of the asylum seeker, what is the estimated error? How invasive is the investigation?

3. **Legal questions**.

What is the legal basis to use a fixed cut-off point like 18 years to differentiate between a minor and an adult? Is an age of 18 years, established for children grown up in a western society, also applicable for a minor growing up under very different and perhaps severely threatening conditions ? Should the best interest of the minor prevail above other legal rules? Should mental/psychological maturity not be a more valid criterion than chronological/physical age?

As the answer to the second question might influence the other issues as well, this aspect will be discussed first.

Medical issues.

The influx of young individuals, who are applying for the international protection in the context of refugee status and asylum, with no valid proof of identity has led to a perceived need for accurate methods of estimating age. There may, or may not, be a direct benefit to the individual in accurate age estimation. While the major challenge to societies is ensuring the appropriate and just handling of refugees and asylum seekers, there are also other challenges. The increase in trafficking of children, notably by the sex industry, adds a further problem related to age identification.

It has been estimated that there were 1.2 million children trafficked each year.[4] Traffickers may claim that children are older than their true age and the victims are intimidated into corroborating the claims.

The relevant medical issues are 1. How reliable are the tests to assess chronological age and 2. Is it unethical to do this kind of measurements if the person does not benefit from this?

Wrist radiographs, clavicle CT scan and dental radiographs can be used for age assessment.

However , both dental and skeletal age methods are limited by their accuracy, with established error ranges of 2-4 years.

The most widely used radiological means of age assessment is the radiograph of the left hand. During skeletal development, the bones of the hands and the wrist undergo predictable changes that are associated with chronological age, specifically in the process of epiphyseal ossification and in size and form. Skeletal development of the hand is typically complete at 17 years in females and 18 years in males.[5]

Reference atlases of hand development have been devised, against which an individual image can be judged (e.g. widely used hand atlas of Greulich and Pyle [12]). It is important to recognise that, assuming a normal distribution of data, +/- one standard deviation indicates only that approximately 68% of individuals will lie within this range. The range for 95% or 99% confidence intervals will obviously be wider. Where bone age estimation is being used as a key determinant of how an individual is handled in a legal context, such inaccuracy is wholly unacceptable. Likely subjects for age estimation (asylum seekers) most commonly originate from sub-Saharan Africa [13] and appropriate reference data are not available. The low socio-economic status and malnutrition that may coincide with refugee status can delay skeletal maturation [10,14]. No studies appear to have been performed in populations from which those requiring age estimation are likely to originate.

Different teeth form at different ages and, at any particular age of childhood or adolescence, characteristic stages of formation of the dentition can be seen on radiographs. The process of tooth formation encompasses approximately the first 20 years of life. Dental development on panoramic radiographs is, however, widely used as a method of chronological age estimation and has been applied to children and young people without valid documentation of chronological age, such as asylum seekers.

Older adolescents and young adults for whom age estimation is required, are at the age where all teeth have completed development except the third molars [16]. Use of third molar development for age estimation is made more uncertain by possible ethnic differences. In the context of refugees and asylum seekers, several important ethnic groups have never been studied and no applicable reference data are available. Thus the absence of applicable reference data increases doubt over the accuracy of age estimations based on tooth development.

Any method of age estimation should involve methods that are scientifically established for which the accuracy and confidence intervals are known. As racial, sex and possibly socio-economic differences exist in dental and skeletal development, the correct reference data should be available and the validity of the method established for the individual case. While the ideal situation would be to identify a diagnostic test that accurately determines chronological age, no such test exists. In reality, age can only be estimated by measuring or observing features that are associated with chronological age. Features include height and weight measurement, signs of sexual maturity and

observation of behaviour . Observation of behaviour has been advised as method to determine if an asylum seeker is “mature”. The royal College of Paediatrics and Child health in the UK emphasizes in their guidelines the relevance of a child's social history as part of the assessment. They recommend that age assessment is carried out as a holistic evaluation, including “narrative accounts, physical assessment of puberty and growth, and cognitive, behavioural and emotional assessments”. These assessments have been criticized because the procedures are rarely well described, how a judgment is reached is not clear and personnel with expertise in child development, like child psychologists and paediatricians are seldom involved. Moreover, asylum seekers are being observed while they are not aware of this observation.

For all these methods, accuracy falls with increase in chronological age, becoming less accurate in adolescents than in younger children, and even less accurate in adults than in adolescents. There is some element of inter-observer variability in addition to this. In asylum seekers, the question frequently posed is “is this subject 18 years or above?” rather than age determination under 10 years. Age determination plays especially a crucial role in determining if an applicant is below or above the critical age of 18 years. To facilitate the estimation of age based on physical assessment, various classification methods for sexual maturity have been devised [5] .All such estimates suffer from broad normal variation ranges. Furthermore, concurrent diseases and malnutrition (malnutrition is not a disease) often delay sexual maturity. While psychosocial assessment provides important indications of maturity, it is influenced by cultural/ethnic background and personal experience of the individual. Poor socio-economic status and being prematurely matured by their life experience is a common feature for refugees and others for whom age estimation is required. [6,7,8]

Is it unethical to participate in these measurements if the person does not benefit from this?

Radiological methods of age estimation have significant limitations and have little if any advantages over clinical and psycho-social assessments of maturity. Over and above this, the issue of obtaining informed consent for X-ray exposure from individuals who may be unaccompanied minors, is often fraught with difficulty.

Without an accurate method of age determination, asylum seekers, illegal immigrants and victims of trafficking in human beings (Human trafficking? It is inhuman.) fail to receive appropriate care and support.

EU countries face significant challenges in identifying the age of individuals who have no valid proof of birth date or identity document.

Article 3 of the European Council Directive 97/43 states that *“special attention shall be given to the justification of those medical exposures where there is no direct health benefit for the person undergoing the exposure and especially for those exposures on medico-legal grounds”*.[9] This important principle is particularly relevant in the case of age estimation, where the affected individuals are likely to be children and adolescents, whose risks from X-ray exposure are greater than those of adults. The methods using X-rays that have been most widely used [10,11] for age estimation are evaluation of the left hand radiograph and of dental development on the panoramic radiograph. CT of the clavicle is also recommended by some authorities.[11] This has a

higher radiation dose than other methods and is not widely used. The asylum seekers are not patients, and therefore physicians have no right to violate the privacy of the individual.

Ethical aspects.

Determination of the age of an asylum seeker who testifies to be a minor can have far stretching consequences. When he/she is judged to be a minor they will not be returned to their country of origin or to another state, but be allowed to stay in the country where asylum is asked, at least till adult age is reached. The question is when adult age is reached in asylum seekers. Individuals who might have experienced important happenings in their life might not have reached maturity in the psychological sense at 18 years. In their behaviour they still might be minors. Is it correct to use as definition of maturity the age of 18 years, as used for people grown up in western Europe ? What might have been the impact of malnutrition, poverty, disasters, stressful factors on the maturational process of an adolescent? Can adulthood be defined with only an age limit?

The next question is if physicians should be part of the legal system deciding about the fate of minor asylum seekers. First, granting asylum is a legal and political issue and there is no medical reason for physicians to be involved, the health of the individual is not at stake. Secondly, can a physician be forced by a government to be involved. When a physician is participating is he/she violating the Oath of Hypocrates? Is the physician responsible for physical and/or psychological damage of the adolescent when he or she is returned to the country of origin based on the opinion of the physician ?

The next issue is getting informed consent. Obtaining a valid, informed consent presents a considerable challenge. Language and cultural barriers, inability to understand what this entails may be substantial and individuals may often be traumatized from past experiences. Furthermore, the validity of consent from an unaccompanied child in such circumstances must be doubted. The basic requirement of a consent procedure, that consent is given completely without any pressure, is violated.

Assessing age might be a benefit for children who are classified, based on the investigations as minors. The will receive shelter in the respective countries. Is this a reason to cooperate with legal authorities and conduct these investigations? Also, when paediatricians are not involved, might other physicians with much less expertise in child development be involved in these determinations. This might increase the risks of wrong assessments. Both arguments do not seem to justify the involvement of paediatricians. In contrast, paediatricians should use their influence to convince other medical specialists to refrain from being involved in these determinations.

Altogether, there are important ethical reasons why physicians should not be involved in the

age determination.

Legal aspects.

According to international Conventions, in all decision involving children and adolescents, the “best interest of the child” must prevail. The minor is not asking asylum without important reasons. Either they did not feel safe enough in their home country, or the parents have send for whatever reason the adolescent to Europe. In both cases the best interest of the child is to find shelter in Europe. Secondly, when arriving in Europe and particularly without proper documentation in support of their stated age, they are in an extreme fragile position. When they are asked to participate in a procedure to determine their age, they are in such a dependent position, they can not refuse. Refusing to participate in such investigations might negatively influence the chance to obtain a visa. The option to appeal to the result of the investigation will also be extremely difficult for these individuals. Basic aspects of normal legal procedures therefore are violated. There are therefore important legal obstacles to the present procedure of age determination in asylum seekers stating that they are minors.

Why should doctors not be involved? It is clear that all methods of radiological age estimation (dental and skeletal) can provide an estimation of age, but there are substantial confidence intervals for the estimated age, especially in older childre , and adequate reference data are frequently unavailable. Estimating the age on a psychological evaluation also is imprecise and lacks a scientific basis. Secondly, it is questionable if one, simple age limit is appropriate for all asylum seekers who are stating that they are minors. Third, the consent procedure will, frequently, not be in accordance with international legally binding standards. Finally, there is no guarantee that decisions made are in the best interest of the adolescent, a requirement contained in international Conventions.

The scientific uncertainty and ethical concerns surrounding radiological age estimation practices have led influential professional medical organizations, including the British Royal College of Paediatrics and Child Health have a policy [17] that: *"there is no single* reliable method for making precise estimates. The most appropriate approach is to use a holistic evaluation, incorporating narrative accounts, physical assessment of puberty *and growth, and cognitive, behavioral and emotional assessments"*. The British Royal College of Radiologists has advised its members that X-rays should only be used in cases of clinical need and that requests for radiography solely for age determination were unjustified. [18] The French Academy of Medicine, the French National Ethic Committee

and the Dutch National Society of Physicians also have advised their members that physicians should not be involved in age determinations in asylum seekers stating that they are minors, given all medical, ethical and legal aspects.

The European Academy of Paediatrics strongly recommends all paediatricians in Europe not to participate in the process of age determinations in asylum seekers stating that they are minors. It also recommends all paediatricians to convey this opinion to all other physicians. They should let the representatives in their countries know that they oppose the Asylum Procedures Directive (2005/85/EC) according to which the Member States may use medical examinations to determine age in relation to the examination of an asylum application.

REFERENCES

1. United Nations. Convention on the Rights of the Child. Adopted and opened for signature, ratification and accession by General Assembly resolution 44/25 of 20 November 1989.

2. UNICEF. Every Child's Birth Right: Inequities and trends in birth registration. New York: United Nations Children's Fund, 2013. (Comment: If my proposal for amendments in para. 2 of the Introduction is accepted.)

3. UNHCR. 2008 Global Trends: Refugees, Asylum-seekers, Returnees, Internally Displaced and Stateless Persons. Field Information and Coordination Support Section (FICSS), Division of Operational Services, Geneva: UNHCR, 2009.

4. IPEC. Training manual to fight trafficking in children for labour, sexual and other forms of exploitation. International Labour Office, International Programme on the Elimination of Child Labour (IPEC). Geneva: ILO, 2009.

5. Schmeling A, Reisinger W, Geserick G, Olze A. Age estimation of unaccompanied minors Part I. General considerations. *Forensic Sci Int* 2006; **159S**: S61-S64.

6. Berger E, Friedrich M, Kaya M. Psychosocial Age Assessment. In: Resource Book for Enforcement Officers on Good Practices in Combating Child Trafficking. Vienna: International Organization for Migration, 2006.

7. Cote S, Geltman P, Nunn M, Lituri K, Henshaw M, Garcia RI. Dental caries of refugee children compared with US children. *Pediatrics* 2004; **114**: e733-740.

8. Singh HK, Scott TE, Henshaw MM, Cote SE, Grodin MA, Piwowarczyk LA. Oral health status of refugee torture survivors seeking care in the United States. *Am J Public Health* 2008; **98**: 2181-2182.

9. European Commission. Council directive 97/43/Euratom of 30 June 1997 on health protection of individuals against the dangers of ionising radiation in relation to medical exposure. Luxembourg: European Commission, 1997.

10. Introna F, Campobasso CP. Biological vs Legal Age of Living Individuals. In: Schmitt A, Cunha E, Pinheiro J (Eds). Forensic Anthropology and Medicine Complementary Sciences From Recovery to Cause of Death. Totowa NJ: Humana Press, 2006.
11. Schmeling A, Grundmann C, Fuhrmann A, Kaatsch HJ, Knell B, Ramsthaler F, Reisinger W, Riepert T, Ritz-Timme S, Rösing FW, Rötzscher K, Geserick G. Criteria for age estimation in living individuals. *Int J Legal Med* 2008 ; **122**: 457-460.
12. Greulich WW, Pyle SI. Radiographicv Atlas of Skeletal Development of the Hand and Wrist. Stanford CA: Stanford University Press, 1959.
13. Schmeling A, Baumann S, Schmidt S, Wernecke K-D, Reisinger W. Reference data for the Thiemann-Nitz method of assessing skeletal age for the purpose of forensic age estimation. *Int J Legal Med* 2006 ; **120:** 1-4.
14. Himes JH. Bone growth and development in protein-calorie malnutrition. *World Rev Nutr Diet* 1978 ; **28**: 143–187.
15. Ludlow JB, Davies-Ludlow LE, White SC. Patient risk related to common dental radiographic examinations: the impact of 2007 International Commission on Radiological Protection recommendations regarding dose calculation. *J Am Dent Assoc* 2008; **139**: 1237-1243.
16. Mincer HH, Harris EF, Berryman HE. The ABFO study of third molar development and the use as an estimator of chronological age. *J. Forensic Sci* 1993; **38**: 379–390.
17. Royal College of Paediatrics and Child Health. Policy: College statement on the role of paediatricians in the age assessment of unaccompanied young people seeking asylum, 2009. http://www.rcpch.ac.uk/Policy (accessed 27/1/2011).
18. Husband J. Letter: Planning Better Outcomes and Support for Unaccompanied Asylum Seeking Children. 23 May 2007. http://www.rcr.ac.uk/docs/general/pdf/AsylumseekersRCRfinalresponse.pdf (accessed 28/1/2011).
19. UNHCR . Guidelines for policies and procedures in dealing with unaccompanied children seeking asylum. Geneva: Office of the United Nations High Commisioner for Refugees 1997 . http://www.unhcr.org/refworld/pdfid/3ae6b3360.pdf .
Competing interests : none declared.
The authors declare to have not received specific grant from any funding agency in the public, commercial or not-for-public sectors.
All authors equally contributed in writing this manuscript.
1
2

3 The editor of the European Journal of Pediatrics

4

5 Dear Editor,

6

7 Hereby we like to submit for publication in the European Journal of Pediatrics our manuscript

8 " Age determination in asylum seekers, physicians should not be implicated (involved?)".

9

10 This manuscript does not describe original research, in this paper we discuss different aspects

11 of the age determination in asylum seekers; medical, ethical and legal and the role of the

12 physician in this process. We conclude with a statement claiming that physicians should not

13 be implicated (involved?) in these procedures.

14

15 The paper represents the opinion of the European Academy of Paediatrics, the umbrella

16 organisation of all national European Paediatric Associations as well as the European

17 Paediatric sub-speciality organisations.

18

19 We hope you will consider this manuscript for publication in your esteemed Journal.

20

21 Sincerely yours, also on behalf of Prof. A. Nicholson and Prof D. Neubauer,

22

23 P.J.J. Sauer

24

25

26

27

28

29

30

31

32

33

34

35

36

37

38

Manuscript

Age determination in asylum seekers: physicians should not be implicated

Pieter J.J. Sauer 1

Alf Nicholson 2

David Neubauer 3

On behalf of the Advocacy and Ethics Group of the European Academy of Paediatrics.

1. Department of Paediatrics, Beatrix Children Hospital/UMCG, Groningen, the Netherlands
p.j.j.sauer@umcg.nl
2. Department of Paediatrics, Children's University Hospital , Dublin 1 . Ireland
Norma.mceneaney@cuh.ie
3. Department of Child, Adolescent and Developmental Neurology, University Children's Hospital, Ljubljana, Slovenia
david.neubauer@mf.uni-lj.si

Correspondence to P.J.J. Sauer, Department of Paediatrics Beatrix Children Hospital/UMCG, Hanzeplein 1 9700RB Groningen, The Netherlands
Phone +31-50-3612430
Fax +31-50-3611704
p.j.j.sauer@umcg.nl

key words: asylum seekers, age determination, bone age, ethics, puberty

word count 2311

What is known.

Asylum seekers without valid documentation claiming to be a minor are entering European countries. Physicians are asked to determine the age in these individuals.

What is new.

The European Academy of Paediatrics advises all paediatricians in Europe , based on ethical, medical and legal arguments, not to be involved in these practice.

Abstract.

Paediatricians and other physicians are asked by legal authorities to help making the decision if an asylum seeker is a minor, defined as an age less then 18 years, or an adult. X/rays are often used for this purpose.

None of the present available methods can accurate determine the age of an adolescent in a normal population and certainly not in refugees who might have either an advanced or delayed maturation due to circumstances during their growth. There are also important ethical reasons why physicians should not be involved in this practice. Finally, a physician can not

be forced by legal authorities to be involved in this practice.

Conclusion: based on ethical, medical and legal arguments, advises the European Academy of Paediatrics all paediatricians in Europe not to be involved in age determination in asylum seekers.

No abbreviations

Introduction

Every year asylum seekers come to Europe. Around four percent of these are, according to their testimony, minors. Because the regulations for admitting or refusing to enter the country are different between minors and adults, governments eager to ascertain the age of the asylum seekers who testify to be minor. The help of physicians is sought to determine the age of these individuals. A proven identity is the key that unlocks the door to participation in society. Date of birth and chronological age but also biological age are determinants of how individuals can participate in, or are treated by, the society in which they live.

The fact that evidence of age is fundamental to the realization of rights and needs in society is recognized in Article 7 of The United Nations Convention on the Rights of the Child, which states that *"The child shall be registered immediately after birth".*[16]

Unfortunately, it has been estimated that around 51 million births go unregistered each year in developing countries, mainly in South Asia and sub-Saharan Africa.[19]

Even when a birth has been registered, the individual may lose the documentation and have no way of replacing it, particularly in times of upheaval such as war and social unrest. The unfortunate geographical coincidences of incomplete birth registration rates, wars and poverty mean that refugees and asylum seekers may often possess no evidence of age.

Worldwide, in 2008 ,there were approximately 827,000 asylum seekers , 44% of whom were children.[18]

Unaccompanied or separated children formed 4% of asylum claims. Age is a key determinant of how an individual is handled in such circumstances and may be the deciding factor in the success or failure of an asylum application. For children, it also defines access to education and health care.

Three important aspects must be considered regarding age determination in minor asylum seekers.

1. Ethical questions.

Is there any justification that physicians be involved in the age determination of a minor, when there is no medical reason to perform an investigation ? Is this dependent on the reliability and invasiveness of the test ? Is consent of the individual needed, and will consent be given freely, without any pressure ? What will the position of the minor be when he/she refuses consent for any procedure ? Does the physician undermine the confidentiality of the patient –doctor relationship by giving his opinion to the legal authorities ?

2. Medical questions.

Are there methods that reliably can estimate the age of the asylum seeker, what is the estimated error ? How invasive is the investigation?

3. Legal questions.

What is the legal basis to use a fixed cut-off point like 18 years to discriminate between a minor and an adult ? Is an age of 18 years, established for children grown up in a western society, also applicable for a minor growing up under very different and perhaps severely threatening conditions ? Should the best interest of the minor prevail above other legal rules ? As the answer to the second question might influence the other items as well, will this aspect be discussed first.

Medical issues.

The influx of young individuals, who are asylum seekers or refugees , with no valid proof of identity has led to a perceived need for accurate methods of estimating age. There may, or may not, be a direct benefit to the individual in accurate age estimation.

The use of X-ray techniques for age estimation raises important issues where a health benefit to the individual may not be demonstrable.

Any method of age estimation should involve methods that are scientifically established for which the accuracy and confidence intervals are known. As racial, sex and possibly socio-economic differences exist in dental and skeletal development, the correct reference data should be available and the validity of the method established for the individual case. While the ideal situation would be to identify a diagnostic test that accurately determines chronological age, no such test exists. In reality, age can only be estimated by measuring or observing features that are associated with chronological age. Features include height and weight measurement , signs of sexual maturity and observation of behavior .

Wrist radiographs and clavicle CT can be used to assess maturity as can dental assessment . However , both dental and skeletal age methods are limited by their accuracy , with established error ranges of plus or minus more than 12 months.

For many methods, accuracy falls with increase in chronological age, becoming less accurate in adolescents than in younger children, and even less accurate in adults than in adolescents. There is some element of inter-observer variability in addition to this . In asylum seekers , the question frequently posed “is this subject 18 years or above?” rather than age determination under 10 years.

Radiological methods of age estimation have significant limitations and have little if any advantages over clinical and psycho-social assessments of maturity. Over and above this, the issue of obtaining informed consent for X-ray exposure from individuals who may be unaccompanied minors , is often fraught with difficulty.

While the major challenge to societies is ensuring the appropriate and just handling of refugees and asylum seekers, there are other challenges. The increase in trafficking of children, notably by the sex industry, adds a further problem related to age identification. It has been estimated that there were 1.2 million child trafficking victims in 2000.[8] Traffickers may claim that children are older than their true age and the victims are intimidated into

corroborating the claims.

Without an accurate method of age determination, asylum seekers, illegal immigrants and human trafficking victims fail to receive appropriate care and support. EU countries face significant challenges in identifying the age of individuals who have no valid proof of identity.

To facilitate the estimation of age based on physical assessment, various classification methods for sexual maturity have been devised [13] .All such estimates suffer from broad normal variation ranges. Furthermore, concurrent diseases , including malnutrition , often delay sexual maturity While psychosocial assessment provides important indications of maturity, it is influenced by cultural/ethnic background and personal experience of the individual . Poor socio-economic status is a common feature for refugees and others for whom age estimation is required. [1,2,15] In children, eruption dates of teeth have, however, a normal variation and cannot give an accurate estimate of age .

Article 3 of the European Council Directive 97/43 states that *"special attention shall be given to the justification of those medical exposures where there is no direct health benefit for the person undergoing the exposure and especially for those exposures on medico-legal grounds"*.[3] This important principle is particularly important in the case of age estimation, where the affected individuals are likely to be children and adolescents, whose risks from X-ray exposure are greater than those of adults. The methods using X-rays that have been most widely used [7,14] for age estimation are evaluation of the left hand radiograph and of dental development on the panoramic radiograph. CT of the clavicle is also recommended by some authorities.[14] This has a higher radiation dose than other methods and is not widely used.

The most widely used radiological means of age assessment is the radiograph of the left hand. During skeletal development, the bones of the hands and the wrist undergo predictable changes that are associated with chronological age, specifically in the process of epiphyseal ossification and in size and form. Skeletal development of the hand is typically complete at 17 years in females and 18 years in males.[13]

Reference atlases of hand development have been devised , against which an individual image can be judged. (eg widely used hand atlas of Greulich and Pyle [4]) It is important to

recognize that, assuming a normal distribution of data, +/- one standard deviation indicates only that approximately 68% of individuals will lie within this range. The range for 95% or 99% confidence intervals will obviously be wider. Where bone age estimation is being used as a key determinant of how an individual is handled in a legal context, such inaccuracy is wholly unacceptable. Likely subjects for age estimation (asylum seekers) most commonly originate from sub-Saharan Africa [12] and appropriate reference data are not available. The low socio-economic status and malnutrition that may coincide with refugee status can delay skeletal maturation [5,7] . No studies appear to have been performed in populations from which those requiring age estimation are likely to originate.

Different teeth form at different ages and, at any particular age of childhood or adolescence, characteristic stages of formation of the dentition can be seen on radiographs . The process of tooth formation encompasses approximately the first 20 years of life . Dental development on panoramic radiographs is, however, widely used as a method of chronological age estimation and has been applied to children and young people without valid documentation of chronological age, such as asylum seekers , dental radiography carries a low effective dose of radiation [9] , of a similar order to that associated with a hand radiograph.

In practice, it is older adolescents and young adults for whom age estimation is required , typically, at these ages all teeth have completed development except the third molars [10]

Use of third molar development for age estimation is made more uncertain by possible ethnic differences. In the context of refugees and asylum seekers, several important ethnic groups have never been studied and no applicable reference data are available. Thus the absence of applicable reference data increases doubt over the accuracy of age estimations based on tooth development.

Ethical aspects.

Determination the age of an asylum seeker who testifies to be a minor can have far stretching consequences. When he/she is judged to be a minor they will not be send back to their home land, but be allowed to stay in the country asylum is asked, at least till adult age is reached.

The question is when adult age is reached in asylum seekers, individuals who might have experienced important happenings in their life. Is it correct to use as definition the age of 18 years, as used for people grown up in western Europe ? What might have been the impact of malnutrition, poverty, disasters, stressful factors on the maturational process of an adolescent ? Can adulthood be defined with only an age limit ?

The next question is if physicians should be part of the legal system deciding about the fate of minor asylum seekers. First, there is no medical reason for physicians to be involved, the health of the individual is not at stake. Secondly, can a physician be forced by a government to be involved, or when participating

is he/she violating the Oath of Hypocrates. Is the

physician responsible for physical or psychological damage of the adolescent when it is send back to their home based on the opinion of the physician ?

Altogether, there are important ethical reasons physicians should not be involved in the age determination.

Legal aspects.

According to International Conventions, in all decision involving children and adolescents, the " best interest of the Child" must prevail. The minor is not asking asylum without important reasons. Either they did not feel safe enough in their home country, or the parents have send for whatever reason the adolescent to Europe. In both cases the best interest of the child is to find shelter in Europe. Secondly, when arriving in Europe and particularly without proper documentation, they are in an extreme fragile position. When they are asked to participate in an investigation to determine their age, the are in such a dependent position, they can not refuse. Obtaining a valid, informed, consent presents a considerable challenge. Language and cultural barriers may be substantial and individuals may often be traumatized from past experiences. Furthermore, the validity of consent from an unaccompanied child in such circumstances must be doubted. The basic requirement of a consent procedure, that consent is given completely without any pressure, is violated. The option to appeal to the result of the investigation will also be extremely difficult for these individuals. Basic aspects of normal legal procedures therefore are violated. There are therefore important legal obstacles to the present procedure of age determination in minor asylum seekers.

In summary, it is clear that all methods of radiological age estimation (dental and skeletal) can provide an estimation of age, but there are substantial confidence intervals for the estimated age , especially in older children , and adequate reference data are frequently unavailable. Secondly, it is questionable of one, simple age limit is appropriate for all minor seeking asylum. Third, the consent procedure will, frequently, not be in accordance with

international regulations. Finally, there is no guarantee that decisions made are in the best interest of the adolescent, a requirement according to International Conventions17.

The scientific uncertainty and ethical concerns surrounding radiological age estimation practices have led influential professional medical organizations , including the British Royal College of Paediatrics and Child Health have a policy [16] that: *"there is no single reliable method for making precise estimates. The most appropriate approach is to use an holistic evaluation, incorporating narrative accounts, physical assessment of puberty and growth, and cognitive, behavioral and emotional assessments"*. The British Royal College of Radiologists has advised its members that X-rays should only be used in cases of clinical need and that requests for radiography solely for age determination were unjustified. [16] . The French Academy of Medicine, the French National Ethic Committee and the Dutch National Society of Physicians also has advised its members that physicians should not be involved in age determinations in minor asylum seekers, given all medical, ethical and legal aspects.

Conclusion. The European Academy of Paediatrics strongly recommends all paediatricians in Europe not to participate in the process of age determinations in minor asylum seekers. It also recommends all paediatricians to convey this opinion to all other physicians.

REFERENCES

1. Berger E, Friedrich M, Kata M. Psychosocial Age Assessment (2006). In: Resource Book for Enforcement Officers on Good Practices in Combating Child Trafficking. Vienna: International Organization for Migration.

2. Cote S, Geltman P, Nunn M, Lituri K, Henshaw M, Garcia RI (2004). Dental caries of refugee children compared with US children. *Pediatrics* ; **114**: e733-740.

3. European Commission (2007). Council directive 97/43/Euratom of 30 June 1997 on health protection of individuals against the dangers of ionising radiation in relation to medical exposure. Luxembourg: European Commission.

355 4. Greulich WW, Pyle SI (1959). Radiographicv Atlas of Skeletal Development of the Hand
356 and Wrist. Stanford CA: Stanford University Press.
357
358 5. Himes JH. Bone growth and development in protein-calorie malnutrition (1978). *World*
359 *Rev Nutr Diet*; **28**: 143–187.
360
361 6. Husband J (2007). Letter: Planning Better Outcomes and Support for Unaccompanied
362 Asylum Seeking Children. (2007).
363 http://www.rcr.ac.uk/docs/general/pdf/AsylumseekersRCRfinalresponse.pdf (accessed
364 28/1/2011).
365
366 7. Introna F, Campobasso CP (2006). Biological vs Legal Age of Living Individuals. In:
367 Schmitt A, Cunha E, Pinheiro J (Eds). Forensic Anthropology and Medicine
368 Complementary Sciences From Recovery to Cause of Death. Totowa NJ: Humana Press.
369
370 8. IPEC. (2009). Training manual to fight trafficking in children for labour, sexual and other
371 forms of exploitation. International Labour Office, International Programme on the
372 Elimination of Child Labour (IPEC). Geneva: ILO.
373
374 9. Ludlow JB, Davies-Ludlow LE, White SC (2008). Patient risk related to common dental
375 radiographic examinations: the impact of 2007 International Commission on Radiological
376 Protection recommendations regarding dose calculation. *J Am Dent Assoc*; **139**: 1237-
377 1243.
378
379 10. Mincer HH, Harris EF, Berryman HE (1993). The ABFO study of third molar
380 development and the use as an estimator of chronological age. *J. Forensic Sci*; **38**:
381 379–390.
382
383
11. Royal College of Paediatrics a 384 nd Child Health(2009). Policy: College statement on the
385 role of paediatricians in the age assessment of unaccompanied young people seeking
386 asylum, http://www.rcpch.ac.uk/Policy (accessed 27/1/2011).
387
388 12. Schmeling A, Baumann S, Schmidt S, Wernecke K-D, Reisinger W (2006). Reference
389 data for the Thiemann-Nitz method of assessing skeletal age for the purpose of forensic
390 age estimation. *Int J Legal Med* ; **120:** 1-4.
391

13. Schmeling A, Reisinger W, Geserick G, Olze A (2006). Age estimation of Unaccompanied minors Part I. General considerations. *Forensic Sci Int*; **159S**: S61-S64.

14. Schmeling A, Grundmann C, Fuhrmann A, Kaatsch HJ, Knell B, Ramsthaler F, Reisinger W, Riepert T, Ritz-Timme S, Rösing FW, Rötzscher K, Geserick G (2008). Criteria for age estimation in living individuals. *Int J Legal Med*; **122**: 457-460.

15. Singh HK, Scott TE, Henshaw MM, Cote SE, Grodin MA, Piwowarczyk LA (2008). Oral health status of refugee torture survivors seeking care in the United States. *Am J Public Health*; **98**: 2181-2182.

16. United Nations. Convention on the Rights of the Child. November (1989).Adopted and opened for signature, ratification and accession by General Assembly resolution 44/25 of 20.

17. UNHCR (1997) . Guidelines for policies and procedures in dealing with unaccompanied children seeking asylum . Geneva: Office of the United Nations High Commisioner for Refugees . http://www.unhcr.org/refworld/pdfid/3ae6b3360.pdf .

18. UNHCR. (2009). Global Trends: Refugees, Asylum-seekers, Returnees, Internally Displaced and Stateless Persons. Field Information and Coordination Support Section (FICSS), Division of Operational Services, Geneva: UNHCR.

19. UNICEF. (2007). Progress for Children. A World Fit for Children Statistical Review. New York:United Nations Children's Fund.

Competing interests : none declared.

The authors declare to have not received specific grant from any funding agency in the public, commercial or not-for-public sectors.

All authors equally contributed in writing this manuscript