

Documenting Traces of Skeletal Trauma Manual

Version 3.0

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5th January 2011

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Part I

General Information

1 Introduction

Purpose

This document is intended to explain how to document traumatic lesions on skeletons using a set of forms designed by Engel and Kramis (2010). These can be obtained from the 'Trauma Analysis on Skeletal Remains' discussion group on ResearchGATE¹ or by contacting us directly².

We would like to stress that we do not have extensive experience in the assessment of skeletal trauma. As a consequence, this documentation scheme is not meant to be authoritative. We hope that colleagues might want to use it and thereby change, improve and expand its features. The current version is largely based on the knowledge of advanced researchers who have been so kind to share their knowledge with us (cf. 'Acknowledgements').

The main incentive for designing these forms was the intention to compare diagnoses across sites and to record observations in a structured way that allows both for quantitative analyses and for an understanding how researchers arrived at their judgements. As there was no established scheme that would have served all these purposes, we decided to make one for ourselves. We were, however, inspired by other, existing systems that serve similar purposes. For the Global History of Health Project skeletal data from a large number of individuals (more than 17,000) has been collected to trace epidemiological trends in Europe³. As for the preceding Western Hemisphere Project (Steckel and Rose 2002), a standardised code book was used to achieve a consistent record of traces. Research on such quantities of data requires

¹http://www.researchgate.net/group/Trauma_Analysis_on_Skeletal_Remains/, last accessed on 23 Dec. 2010. You will have to sign up with ResearchGATE in order to join the group and download the files. This procedures are all free of charge. As a group member you will have constant access to the latest document versions and you can participate in discussions on their improvement.

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³<http://global.sbs.ohio-state.edu>, last accessed on 23 Dec. 2010. The website provides preliminary results presented at the 2009 annual meeting of the American Association of Physical Anthropology and the code book for downloading.

1 Introduction

a rather abstract coding of observations that are analysed in terms of large regions. Our scheme focuses on the comparison of sites and goes into a much more detailed description of lesions. Similar to the Global History of Health Project's code book, however, we assume that skeletal remains have been recovered from graves and that this context allows for an assignment of bones to individuals. Other contexts, where bones from several individuals were deposited together, might not provide this kind of information. This is a standard scenario in archaeozoology which led to the development of 'Ossobook' (Kriegel et al. 2009; Schibler 1998), a system for processing animal bones from archaeological sites⁴. Here, pathological and taphonomic traces are recorded for every single bone or fragment. Depending on the archaeological context, this might also be the preferred approach for human remains, as demonstrated by Osterholtz and Stodder (2010). Our documentation scheme, however, is specifically designed for the analysis of human remains from burials.

Pathological data are to be made available for the following purposes:

- A detailed report on a palaeopathological investigation that will still be comprehensible long after the analysis and that is understood by other researchers who did not partake in it.
- A quantitative analysis of pathological traces within the population taking into account taphonomic loss of material.
- Pooling of data from several sites and documented by different researchers for analyses above site level.

Although the immediate task has been a standardised record of skeletal trauma, the basic structure of our documentation system can be easily extended to other types of pathologies. Information on each individual is recorded in a base sheet (cf. 'SK - Skeleton'). To this file, a variety of forms can be added, designed to hold information on different kinds of disease. These structured records will enable the construction and comparison of detailed health profiles of skeletal populations and individuals (Steckel et al. 2002, a).

It is not within the scope of this document to explain the principles of trauma analysis. For an introduction to the subject we refer to the standard literature (Lovell 1997; König and Wahl 2006; Ortner 2003; Aufderheide and Rodríguez-Martín 1998; Madea and Dettmeyer 2007).

⁴The data management software can be downloaded from <http://sourceforge.net/projects/ossobook>, last accessed on 23 Dec. 2010.

1 Introduction

As indicated above, this compilation is a work in progress. Future additions envisaged at the moment are a routine for specifying qualities of the population from which the skeletal material derives, forms to describe the archaeological contexts of bones that cannot be attributed to a specific individual and an SQL data base to process information collected through the forms. We welcome critique, corrections, suggestions and all kinds of collaboration that helps to improve and extend this scheme. Especially, if you have been working on some kind of skeletal pathology lately, you might consider creating a new module for this kind of traces. This, in turn, could be used and improved by other researchers. If you consider a contribution, you can contact us through the ResearchGATE group (see footnote 1) or approach us directly (cf. addresses in footnote 2).

How to read this document

In part II (Forms) instructions are given how to fill out each of the forms that are currently available. This is the core interest of the manual. All information in the various items are intended to relate to each other in order to create a concise record. To assist with these connections, sections that are relevant to the current article are indicated in the margins. An example of such an annotation can be found to the right of this paragraph. For the PDF version of this document, all references to other sections, literature references, figures etc. have been created as interactive links. These internal references are meant to facilitate navigation within the document.

Notes like this refer to other parts of the document.

Chapter 2 explains how the documentation system works in general. It is advisable to read this before starting with the individual forms. Some remarks on the use of the paper forms and their general features are made in Chapter 3. Chapter 4 contains some notes on the documentation of skeletal trauma. As mentioned in section 1, trauma is the only module to date but might be complemented by other modules in the future.

This system is a work in progress. Immediate tasks that will bring some improvement are set in boxes like this.

Acknowledgements

The initial setup of this system was based on counselling from Christian Meyer (Cologne) and Linda Fibiger (Cardiff), who were very open in sharing their own systems, devised for their respective doctoral theses. Later refinements benefited

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from continuing support by Christian Meyer and, especially, Professor Dr. Joachim Wahl, who invested a lot of energy and time in discussing individual cases of trauma with us and who gave important stimuli for the composition of forms.

The documentation system is, in part, a product of a student project at Freiburg University, aiming at standardised records in palaeopathology. We thank Linda Hartung, Mareen Kästner and Christian Weißhaar for their commitment, help and support.

Much work on the documentation system has been done as part of Felix Engel's dissertation which is sponsored by the Gerda Henkel Foundation⁵.

In the creation of the documentation system and this manual, open source software has been used and we acknowledge voluntary work from the following communities: OpenOffice.org⁶, GIMP⁷, Inkscape⁸, LaTeX⁹, Lyx¹⁰ and JabRef¹¹.

⁵<http://www.gerda-henkel-stiftung.de>, last accessed 28 Dec. 2010.

⁶<http://www.openoffice.org> and The Document Foundation
at <http://www.documentfoundation.org>, last accessed 28 Dec. 2010.

⁷<http://www.gimp.org>, last accessed 28 Dec. 2010.

⁸<http://inkscape.org>, last accessed 28 Dec. 2010.

⁹<http://www.latex-project.org>, last accessed on 5 Jan. 2011.

¹⁰<http://www.lyx.org>, last accessed 28 Dec. 2010.

¹¹<http://jabref.sourceforge.net/>, last accessed on 5 Jan. 2011.

2 Principles of the documentation Scheme

Part II contains detailed directions how to complete the various forms. But in order to understand how these are meant to form one coherent documentation of a palaeopathological examination, some general principles have to be explained. In this chapter, the forms are grouped according to the objects they describe and the order in which they will be used. Figure 2.1 plots the course of a typical examination onto these two categorisations.

Levels of Examination

Palaeopathological data is collected and processed on the following levels:

Traces Bone alterations on skeletal elements that reveal information on singular pathological afflictions.

Individual Reconstruction of personal health profiles and individual life histories from all pathological traces observed in one skeleton.

Population Analysis of Frequencies of pathological traces in the skeletal population and reconstruction of population health profiles.

Region Analyses of data from several sites, including comparisons of health conditions in different places and variations of frequencies in relation to environmental factors.

Generally, we assume that the skeletal material to be analysed comes from a graveyard or other archaeological context that allows to assign most of the bones to specific individuals. Information on this level are recorded in a form called 'SK - Skeleton'. This serves as a master sheet for all other forms that relate to the same individual. It covers the skeleton's identity (i. e. how it is registered in existing documentation)

2 Principles of the documentation Scheme

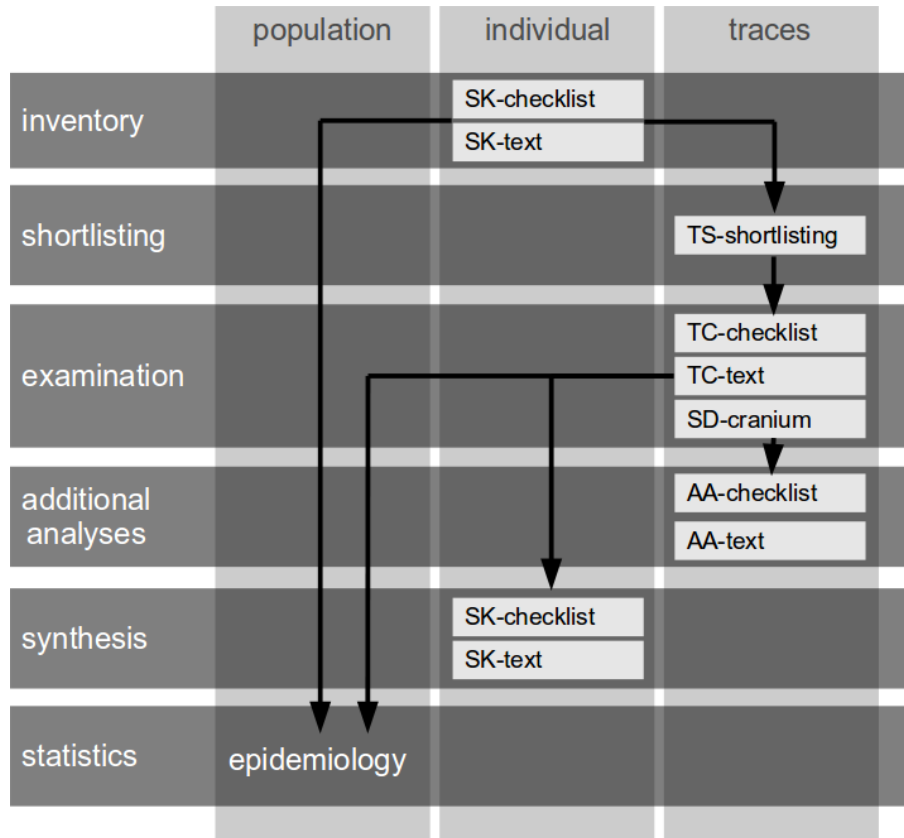


Figure 2.1: Workflow and levels of examination in an examination of cranial trauma (adapted from Engel and Kramis 2010, fig. 1).

2 Principles of the documentation Scheme

and material preservation. On the other hand it lists all individual analyses documented on other forms and draws a synthesis of their results, thus forming a concise diagnosis. As a consequence, the contents of the SK form are constantly altered and extended with every new analysis, documented on additional forms.

Some archaeological contexts (e. g. sites of accidents or heavily disrupted depositions), however, might just yield some unarticulated bones that cannot be attributed to specific skeletons. Here, a minimum number of individuals might be assumed but the scope for palaeopathological reasoning is limited. Still, individual traces can be recorded as usual and may be grouped according to find assemblages like archaeological features or strata that might have significance for interpretation. Forms to deal with this kind of situation do not yet exist but might be included in future versions.

All individuals have to be assessed in terms of taphonomy, even if they do not carry any pathological traces. This is needed to assess the number of individuals on which any occurring trace could potentially have been found, serving as a basis for calculating the frequencies of observations.

Any bone alterations that can be observed on the skeleton are referred to as traces. Traces can have different causes. Pathological traces are understood to have been caused by some kind of disease, taphonomic traces by processes affecting the skeletal material between its deposition in the ground and its scientific recovery. A skeleton might display several pathological traces of the same kind (e. g. continuity disruptions) or of different kinds. For each kind of traces, a special set of data forms is provided for documentation. Note that, in this context, 'kinds of traces' does not refer to different diagnoses (specifying the diseases that caused them). Forms are designed for traces that are morphologically similar and can be described in similar terms. Pathological examination might determine different reasons for their existence. A possible outcome of this process is always the dismissal of traces as taphonomic in origin.

So for each individual a varying number of traces are described and interpreted, using different forms. These are filed together with the Skeleton base file. Which traces and how much of them should be described in one form depends on the nature of the traces and on examination strategy. In terms of trauma, one form could be used to document traces that are likely to have resulted from the same incident of traumatisation. However, this might not be the most appropriate strategy in all cases. Take for instance a blow to the head fracturing the cranial vault in direct traumatisation but also causing indirect damage to the skull base. Both lesions are caused by the same act of traumatisation, but as they occur in completely different areas of the skull it will be easier to describe them separately and link the two observations in interpretation. Ultimately, the decision what to record in one go will

have to be made on practical grounds for each case.

Workflow

The previous section, 'Levels of Examination', has outlined a hierarchy among the data forms, based on the part of the material they address. But the forms are also designed to take the researcher through the several steps of examination. Basically, these procedures are selection processes to choose certain parts of the material for further analyses on a more detailed level.

Site Registration

The first thing to record when picking up a new volume of material are information on the site from which it has been recovered. This is particularly important if several sites are to be compared to find out about varying conditions in different places. But even if an examination just covers one site, we believe it is good practice to keep these records well structured with the rest of the documentation for better understanding site specifics like archive numbers or particular issues in excavation. Other researchers working with the documentation will need to know these things in order to understand connections within the material. For the time being, there is no standardised routine for site registration. But such a feature should be included in future versions.

Inventory

This step involves a thorough assessment of material preservation for all individuals. It is recorded which skeletal elements are at all available and where taphonomic lesions might hamper pathological examination. Frequencies of pathological affliction cannot be calculated in respect to the total number of individuals, unless these are all complete and well preserved. For most archaeological sites it is necessary to assess for each location of traces on how many individuals a similar occurrence could have been observed.

The skeleton inventory is created using the form 'SK - Skeleton'.

Shortlisting

What kinds of palaeopathological investigation can be carried out on a skeleton is mostly determined by the presence or absence of the various skeletal elements.

2 Principles of the documentation Scheme

Tooth status, for instance, will be assessed on all skeletons for which some part of the dentition is preserved. Presence or absence of lesions, like caries, is recorded for all individuals. Other types of lesions, however, will only require documentation for some select individuals. One example for such lesions are traces of trauma, that are relatively infrequent and require complex description and interpretation.

Selecting individuals for this kind of documentation is an important process as those skeletons which are not chosen will be excluded from examination for good. To exclude material in an analysis should be just as conscious a decision as including specimens. As a consequence, it should be recorded, if an individual has been surveyed for a certain type of traces and a decision has been made whether to put it down for further treatment. We refer to this process as 'shortlisting' and propose special forms for documentation.

There are a number of advantages to shortlisting the whole material before starting the examination as such. Researchers gain a general idea of what kinds of traces are present. They can group cases to facilitate coherent description. In trauma analysis, for example, all cases bearing traces of sharp force can be described one after the other for better comparability.

We suggest to be as inclusive as possible while shortlisting material. It will always be possible to take individuals from the shortlist before the actual documentation, if - after comparison with other cases - traces turn out to be certainly taphonomic or within anatomic variation. In many cases, traces are debatable and we believe these should be fully documented, even if they are not assumed to be caused by disease. Other researchers might not agree with a diagnosis and for them it will be essential to understand the reasoning behind it. Information why ambiguous traces are classified as taphonomic is just as important as reasons to declare them pathological. Either way, a fully documented examination will also help investigators to make a conscious decision.

The form 'TS - Trauma Shortlist' has been created to shortlist material for trauma analysis.

Examination

Forms devoted to pathological analysis have three sections:

Localisation The exact position of traces on the skeleton is important for several reasons. Calculations of frequencies are only possible if the location of traces can be compared to the number of skeletons for which this element is preserved. Also, if other researchers would like to re-evaluate the investigation and its

2 Principles of the documentation Scheme

results, it is essential to know exactly what traces have been examined.

Description Following medical standard procedures, we try to separate a mere morphological description of observations from the interpretation that is subsequently inferred from the traces. Ideally, other researchers should be able to make use of the descriptive part, even if they do not agree with the interpretation. In practice, it can be rather difficult to keep up a clear-cut distinction between the two sections. Descriptions might use terms that already imply a certain interpretation and any radical attempt to avoid such corruption would probably result in endless and complicated text passages. However, the two-step approach will help to make reasoning clearer. And it also helps investigators to follow a rigid line of inference without jumping to conclusions.

Interpretation All statements made in this section should correspond to observations made in the descriptive part. It is, therefore, important to know what evidence will be needed for interpretation while traces are described. On the other hand, descriptions should be added to the respective section if interpretation shows that necessary observations have not been made. In the end, the whole documentation should be a concise system of evidence and conclusion. Obviously, interpretation should arise naturally from the description of traces instead of modelling these on some preconceived interpretation.

The separation of observations and conclusions is particularly important if data from several sites and produced by different investigators are to be pooled in large-scale studies. As it is often debated what kind of traces are left by certain pathologies, such studies should rather be based on descriptions of traces than on diagnoses.

To date, there are two forms for pathological analysis of traces from traumatisation of the cranium ('TC - Cranial Trauma') and the postcranial skeleton ('TP - Postcranial Trauma').

Additional Analyses

Some cases might necessitate special investigations in separate laboratories and employing specialised machinery. Examining trauma, for instance, x-ray scans might be needed to identify healed fractures and other features that are not visible on the surface. These cases are to be put aside during analysis, together with exact instructions what special measures are required. Forms for this purpose have not yet been developed but should be included in future versions.

2 Principles of the documentation Scheme

Synthesis

Assessments of various pathologies should lead to the reconstruction of individual health profiles. For this concluding discussion there is a section ('SK IV. Synthesis') in the form 'SK - Skeleton' that has also been used for the skeletal inventory.

3 Remarks on Forms

Medium


Up to now, forms are meant to be printed out and completed by hand. Paper forms can be used around the skeletal material without fear of dirt, as it would be the case with computers. Several researchers can work simultaneously, even without electricity. Also, in the long run, paper is the most durable medium to archive information. However, at some stage information will have to be made available for electronic processing and re-typing the form entries into a data base is both tedious and an additional source of potential errors. In the future it might be preferable to enter information directly into a data base and subsequently archive a set of printouts.

The paper forms are designed to be reproduced as double-sided copies (i. e. both sides of the sheet are used). A minimal number of sheets reduces the documentation volume and limits the danger of sheets getting lost.

Types of Forms

The following instructions are intended to help researchers with the completion of the data forms. There are several types of sheets:

checklists These are the centre pieces of each analytical step. They contain the list of items that are covered in the examination. Information that is coded according to set categories is entered directly in the form.

text Other items require free text of varying length. These are marked with the symbol . The text is to be entered in a special sheets provided for this purpose. Free descriptions are noted here, citing the item number given in the checklist.

schematic drawings Schematic outline drawings are provided to sketch the position of lesions on the bone. The checklists contain items that require to measure

3 Remarks on Forms

dimensions of traces. Points and distances employed in making these measurements are also to be indicated in the drawings.

Schematic drawings can be applied universally with all kinds of traces. They are described in chapter 10. Regarding checklists and text sheets, it will be indicated for every form which types are available.

Form Administration

All forms have a header, where the type of form and the version number are stated. There is a box on the right, containing administrative information. If forms are left with parts of the material during examination, an exact identification of the skeletal remains should always be possible by the specifications on the sheet.

At the end of sheets, researchers are asked to give their names and the dates on which they issued the form and on which they finished working on it. These data will be used if researchers have to be contacted for questions concerning entries they made. Knowing about the time when forms were completed also helps to understand their contents as examination guidelines might change during the course of an examination.

How administrative items are completed, is explained with the directions for the respective forms in part II.

List of Forms

The current version comprises the following forms:

SK-checklist.pdf	Basic skeleton sheet , cf. 'SK - Skeleton'.	SK - Skeleton
SK-text.pdf	Appendix to SK-checklist for records in continuous text.	
TS-checklist.pdf	Shortlisting form for trauma analysis, cf. 'TS - Trauma Shortlist'.	TS - Trauma Shortlist
TS-text.pdf	Appendix fo TS-checklist for records in continuous text.	
TC-checklist.pdf	Trauma analysis of the skull, cf. 'TC - Cranial Trauma'.	TC - Cranial Trauma
TC-text.pdf	Appendix to TC-checklist for records on continuous text.	
SD-CraniumFrontal.pdf	Schematic drawing of cranium in frontal view.	SD - Schematic Drawings

3 Remarks on Forms

SD-CraniumLeft.pdf Schematic drawing of cranium from left.

SD-CraniumRight.pdf Schematic drawing of cranium from right.

SD-CraniumDorsal.pdf Schematic drawing of cranium in dorsal view.

SD-CraniumSuperior.pdf Schematic drawing of cranium seen from above.

4 Analysis of Trauma

Because of the unique architecture of the cranial vault in comparison to other bones in the body we make a general distinction between the analysis of cranial and post-cranial trauma. Special forms have been created for these two skeletal elements (cf chapter 8 and chapter 9 for post-cranial trauma). Though most of the parameters apply to all bones, the whole mechanics of fracture in the spherical skull and the mostly elongated bones of the postcranium create entirely different fracture patterns that are covered in the respective checklists. So far, the scheme has been mainly applied to skulls which has resulted in a more extensive development of cranium-related aspects. This part of the scheme has changed a lot in practice since its initial design, solely based on theoretical considerations. Similar alterations are to be expected when using the form designed for post-cranial longbones.

Part II

Forms

5 PO - Population

Population-related Information

A concise palaeopathological documentation should include information on the body of material that is examined. This should include details on the material's recovery (e. g. through excavation), the institution where it is stored and on contextual evidence that might help the interpretation of results. So far, a routine to record such information has not been developed but should be included in future versions.

The Form should include the following features:

- **details on institutions and people conducting the examination (names, times of employment, qualifications, contact information)**
- **details on the excavation or other ways of recovery, references to reports and publications**
- **details on institutions where the material is kept (contact information, inventory systems and numbers)**
- **concept and regulations for the examination, changes during the work period, conducted analyses, mistakes**
- **discussion of the skeletal population (completeness and missing material, state of preservation, taphonomic mechanisms, specific site characteristics like hospital or military cemeteries, archaeological context)**

Administration of Analyses

Another requirement on population level is to keep a list of the various examinations for different types of traces that are conducted. As every diagnosis has its own distinct number, a central record is necessary to make sure that no number is issued

5 PO - Population

twice. The simplest way to achieve this is to keep a list where every form has to be registered before the beginning of the examination. The administration of analyses, however, is one of the strongest arguments for the employment of a data base which allows a number of queries, including lists of examinations carried out for each individual or individuals for which a certain examination has not yet been carried out. Ultimately, such a system should be capable to administrate the actions of various researchers that simultaneously conduct different kinds of examination on the same skeletal material. Up to now, there is no standardised list to register forms, but it should be included in future versions.

While a paper form for registering analyses would be rather simple, the creation of an administrative module for a data base is a more challenging task. It should connect analyses, individuals and researchers and offer time management functionality. It can be integrated with a log book, giving the opportunity to trace back all incidences during examination.

6 SK - Skeleton

The purpose of this form is to register bone material attributed to one skeleton for examination and to record information that relates to this individual. The form SK-Skeleton serves as a base sheet for documentation on one individual and carries the sheet number 0. The first form to document any pathological analysis on this individual will carry the sheet number 1. There is a checklist (SK-checklist) and a form for free specifications (SK-text).

At the moment it is assumed, that all bones can be attributed to specific skeletons. In future version an alternative form is to be introduced that allows to register bone assemblages for which this is not possible, like additional bones from a grave or material from archaeological units.

Administration of Individuals

These items are contained in the document header.

skeleton ID

A distinct number to identify the skeleton to which this form relates. The number is issued for the current examination. It may be taken from a numbering established in an earlier inventory, or a new numbering is devised for the current examination. Which system is used, is explained for the whole body of skeletal material (form PO - Population). By issuing this form for a skeleton, it is registered for examination and all other documentation relating to this individual has to bear it as a reference.

PO - Population

box

This field contains information on how to find the skeletal material assigned to this individual in the archive where it is stored. What this information might be exactly,

6 SK - Skeleton

depends on the conditions under which the material is kept and investigated. In a standard setting, this might be an inventory number, often referring to a box or other container in an archive. How this information is handled for the current examination is explained for the whole body of skeletal material (form PO - Population). Storage specifications are included in the forms to facilitate logistics during examination (e. g. when skeletal material is returned to the container after having been processed) and to enable other researchers to find the original material for re-examination.

PO - Population

material

The empty room in the lower part of the box is reserved for indicating the body of material on which the examination is conducted. Typically, this will be the site name or some similar catchword that is identical on all sheets. It should, therefore, be part of printouts or masters for photocopies. In the PDF versions, this is a form field that can be completed using appropriate software for editing such files¹. The full information referenced by the short form entered here is given in the form PO - Population.

PO - Population

SK I. Individual Data

SK I.1 Existing Documentation

The items in this section give references to this individual in previous documentations. Usually, these are the excavation report and probably some former assessment of the skeletal material. Which documentations are referenced is explained in the form PO - Population.

PO - Population

1 structure Reference number of the archaeological structure from which the skeletal remains have been recovered.

2 layer Reference number of the excavation unit (e. g. layer or quadrant) that contained the skeletal material.

¹There are a number of proprietary programmes for completing PDF forms. Here are some examples of applications under Windows that can be downloaded without payment: PDF Xchange Viewer, <http://www.tracker-software.com/product/pdf-xchange-viewer>; Foxit Reader, <http://www.foxitsoftware.com/pdf/reader/reader4.php>. Additional programmes with a similar scope of features exist. Macintosh users can use the operating system's default file viewer. Some applications allow for placing text objects into existing PDF files. This is another option to prepare masters for print.

6 SK - Skeleton

- 3 finds** Reference number in the inventory of archaeological finds from the excavation under which the skeletal remains are recorded.
- 4 grave** Reference number of the grave from which the skeletal remains have been recovered.
- 5 skeleton** In multiple burials, skeletons are usually numbered or otherwise referenced. If this is the case with this individual, this reference can be recorded here.
- 6 individual** If there is an alternative numbering of individuals (e. g. from an earlier assessment of the skeletal material) that differs from the system used in the current examination (cf. 'skeleton ID'), the reference for this individual can be recorded here.

SK I.2 Demographic Data

These are summarised results from age and sex assessments that are documented in greater detail elsewhere. In the future, this might become modules of the documentation system but for the time being, this information will have to be obtained from elsewhere (as specified in form PO - Population). The information is included here for quick reference as it might assist in the interpretation of pathological traces.

PO - Population

Sex and age assessments can be scored on various scales. At the moment, these will differ for estimations done on different bodies of material. As comparability of results is essential for the pooling of data, the establishment of modules for sex and age assessment is to be desired for future versions.

- 1 sex** Score from the sex assessment. Various scales may apply.
- 2 sex indetermined** Tick if sex estimation is impossible because of poor material preservation or indistinct skeletal features. Explain reasons for the missing of an assessment under section 'SK I.4 Remarks on Individual'.
- 3 age category** Age category according to age estimation. Various scales may apply.
- 4 age minimum** Minimum value for age at death according to age estimation.
- 5 age maximum** Maximum value for age at death according to age estimation.

SK I.4 Remarks
on Individual

6 SK - Skeleton

6 age indetermined Tick if age estimation is impossible because of poor material preservation or conflicting expressions of skeletal features. Explain reasons for the missing of an assessment under section 'SK I.4 Remarks on Individual'. SK I.4 Remarks on Individual

SK I.3 Previous Pathological Observations

Describe any pathologies that have been diagnosed or suspected in previous assessments. These assumptions can be proven or contested by the current examination. The information might also help in the interpretation of pathological traces that might be influenced by other types of disease. Use the text form SK-text for a description in coherent sentences.

SK I.4 Remarks on Individual

Give any additional information that is relevant to the individual and the attributed skeletal remains. These might also be comments on other items within the section 'SK I. Individual Data'. Use the text form SK-text for specifications in coherent sentences.

SK II. Inventory

This section is intended to record which skeletal elements are preserved and to what extend.

SK II.1 Skeleton Diagram

The diagram on the right side of the form has been proposed by Mirjana Rokсандić (2003). We prefer this over other representations because the surfaces are shown as if spread out on a plane and all areas can be addressed in one graphic. This avoids mistakes that are frequent when dealing with several pictures, offering different views on the skeleton.

The parietal bones are too small in this diagram and will have to be adjusted for future versions. Also, the size is currently too small. Instead, the graphic should be made available as a full sheet in the series of SD forms for schematic drawings. While we currently use a bitmap file extracted from Roksandic's article, the drawing should be vectorised for better quality.

Hatch the areas in which the bone is preserved and colour them entirely if the surface is also intact. The distinction between these two areal signatures is important, as most pathological traces can only be observed on the surface. However, it will have little bearing on the colouration of the diagram, unless large surface areas have been destroyed by taphonomic processes. If these losses are small, however, the preserved parts will mainly be coloured opaquely.

SK II.2 Coding Preserved Areas

Additional to the visual representation offered by the diagram, it is advisable to create a coded record of what skeletal elements are available for examination. To this end, the bones of the skeleton are divided up into sections and these are evaluated. This might either be done in a simple two-state system of present/absent, or on a graded scale (e.g. in steps of 25 percent - i.e. 0 %, 25 %, 50 %, 75 % or 100 %). Several schemes how to define the areas to be assessed have been proposed. Up to now, none of these have been implemented in the documentation system. Instead, it is just recorded whether or not material preservation has been coded. Tick 'concluded', if such a procedure has been carried out and 'omitted', if for some reason it has been decided not to do so. In the latter case, give reasons under 'SK II.3 Remarks on Inventory'.

SK II.3 Remarks
on Inventory

There are several advantages to coding material preservation. It may help to select individuals for certain types of examination (for example, skeletons where the epiphyses of long bones are not preserved, can be excluded from assessments of degenerated joint disease). After pathological analyses have been concluded, it will assist in the calculation of frequencies and other analyses on population level. If an observation has been made on a certain skeletal element, only those individuals can be used for comparisons, for which the same element is also preserved. Here, a gradual coding scale would be most beneficent, as both an assessment of 0 % and of 100 % are valuable information, while in cases of partial preservation it is worthwhile to check the possibility of a similar observation.

In order to optimise comparability between records, the inclusion of a standardised coding system is to be desired. If the skeleton diagram is to be removed onto a separate form (cf. box in section 'SK II.1 Skeleton Diagram'), the coding scheme could be integrated into the SK checklist.

SK II.3 Remarks on Inventory

Write down any information relating to the inventory and its creation. Use the form SK-text for specifications in coherent sentences.

SK III. Taphonomy

SK III.1 Taphonomic Traces

Tick all kinds of traces that can be found somewhere on the skeleton. For any trace that is not covered by the given options, tick 'other' and explain under 'SK III.2 Description of Taphonomic Traces'. The information entered in this section can be used to filter the descriptions of material condition, if a certain type of traces is of interest. Also, the various conditions can be plotted out to analyse spatial differences in preservation on the site.

SK III.2
Description of
Taphonomic
Traces

The list of taphonomic processes has been built up during one examination of a large skeletal population. As a consequence, it is not well structured and concise. There is ample room for improvement here.

SK III.2 Description of Taphonomic Traces

Use the form SK-text for a description of taphonomic traces in coherent sentences. Make sure to cover all traces specified in section 'SK III.1 Taphonomic Traces' and, especially, to account for those missing from the list (which made you tick the option 'other').

SK IV. Synthesis

This section is designed to be filled out gradually, while the stock of analyses carried out on the individual is building up. It provides a summary of the current state of

examination.

SK IV.1 Diagnoses

This is a list of all analyses on the skeleton that have been carried out or are currently under way, using one of the forms in the documentation system. Space for up to eleven of these analyses is provided. If a new form is started, the two-letter code indicating the type of examination (e. g. 'TC' for cranial trauma) is entered next to the number in the list. Below the short horizontal line, the trace ID, under which the new form has been registered, is noted. After the examination is finished and has been concluded with a diagnosis, this is entered in the large empty space. Few catchwords are sufficient to describe diagnoses (e. g. 'weapon trauma' or 'depressed fracture'). They are just intended to remind of the results that have accumulated. The actual information is all in the respective forms.

TC III.4.1
Location

SK IV.2 Life History

Various types of disease leave traces at different ages, and these traces are visible for different periods of time before they are obliterated by bone remodelling. Based on these conditions, summarise what is known about diseases and degenerative processes throughout the individual's lifetime. Be sure to include all diagnoses listed in section 'SK IV.1 Diagnoses'. Use the form SK-text for specifications in coherent sentences.

SK IV.1
Diagnoses

SK IV.3 Health at Death

Summarise the individual's health condition at the moment of death. Assess, to what extent the conditions described in section 'SK IV.2 Life History' had a bearing at that moment. Ultimately, discuss if there is any evidence for what led to the individual's death. Use the form SK-text for specifications in coherent sentences.

SK IV.2 Life
History

SK IV.4 Remarks on Health Synthesis

Give any additional information on the items in this sections, how the evidence was produced and how conclusions have been established. Use the form SK-text for specifications in coherent sentences.

SK V. Remarks

SK V.1 Remarks concerning this individual

This space is for any additional information on the individual that does not fit with the remark items in any of the other sections. Use the form SK-text for specifications in coherent sentences.

Research Administration

At the bottom of the second page there is a box with the following items, that are concerned with the administration of the examination process.

name Place your name here. Several names might be given, if different researchers carry out various kinds of examinations and update the section 'SK IV. Synthesis' in turns.

date started If you have started this form today, enter the date here.

date finished When all types of analyses have been conducted on the skeleton and the examination concluded, enter the date here.

7 TS - Trauma Shortlist

The purpose of this form is to document the first step in trauma analysis: the selection of individuals for a more detailed examination (cf. section 'Shortlisting'). In most cases, completing the checklist will not take much time. Keep in mind, however, that this is the final piece of documentation for individuals that are excluded. All noteworthy observations concerning the presence - or rather absence - of traces of trauma have to be placed here. There is a checklist (TS-checklist) and a form for free specifications (TS-text).

Administration of Trauma Shortlisting

These items are contained in the document header.

- skeleton ID** Copy the individual identification number given in the item 'skeleton ID' from the form SK - Skeleton. skeleton ID
- sheet** Look up the sheet number within the documentation referring to the individual by checking with the last document therein and enter it here.
- box** Copy the archive reference given in the item '6' from the form SK - Skeleton'. box
- material** In the empty room in the lower part of the box all forms should give the same catchwords describing the body of material as in item 'material' from the form SK - Skeleton'. material

TS I. Suitability for Examination

TS I.1 Obviously Complete?

Usually, parts of skeletal remains from archaeological contexts are lost due to poor preservation. In this respect, skeletons cannot be expected to be complete. Here, 'completeness' refers to the material that was present after recovery (mostly through

7 TS - Trauma Shortlist

archaeological excavation). There are two sheets, a checklist and one for recording continuous text.

TS I.1.1 Classification

Tick 'no' if you have any suspicion that parts of the material might have been lost during previous examinations or may be stored in another place. In this case, specify your concerns in section 'TS I.1.2 evidence for missing material'. If completeness can be assumed, tick 'yes' and proceed to section 'TS I.2 Suitability of Material'.

TS I.1.2 evidence for missing material

If you ticked 'no' in section 'TS I.1.1 Classification', use the form TS-text to explain in coherent sentences what makes you think that some of the material might be missing. TS I.1.1 Classification

Section TS I.1 has been inserted during work on material that had been examined years before. As a consequence, a documentation of preservation and taphonomy was already present. In future versions the item should be moved to the form SK - Skeleton.

TS I.2 Suitability of Material

This section offers the possibility to exclude individuals from examination. For excluded skeletons, no assessment is made if traces of trauma are present or not. Mostly, this is appropriate if material preservation is very bad (e. g. if only teeth or very little bone splinters are left).

TS I.2.1 Classification

If you deem the material to be inappropriate for examination, tick 'no' and explain in section 'TS I.2.2 Reasons for Exclusion'. A possible reason for such a decision might be very poor preservation, e. g. if only parts of the dentition are left. By excluding the individual at this stage you avoid the effort of shortlisting. Only do this in truly appropriate cases. If there are no objections, tick 'yes' and proceed to section 'TS II. Suspected Traumatization'.

TS I.2.2 Reasons for Exclusion

If you ticked 'no' in section 'TS I.2.1 Classification', use the form SK-text to explain in coherent sentences why the individual should be excluded from trauma analysis.

TS I.2.1
Classification

TS II. Suspected Traumatization

In this section you can specify traces that might qualify the skeleton for an examination of trauma. These traces may be truly caused by trauma or easily mistaken as such. Even if you do not think that trauma was the real cause, you might still point out traces that could be mistaken as related to trauma by others. Detailed examination will clarify all kinds of assumptions and serves just as well to make a case against a diagnosis of trauma as it does for such an assessment.

TS II.1 Detailed Examination Considered

Decide whether to include the skeleton into a more detailed analysis of trauma or not. Tick 'yes' if you believe that traces on the skeleton might be interpreted as caused by trauma - either by yourself or by any other researcher. Specify your judgements in the following sections. If there are no traces that might arguably be related to trauma, tick 'no' and proceed to section 'TS III. Documentation'.

TS II.2 Traces

If you ticked 'yes' in section 'TS II.1 Detailed Examination Considered', specify the kinds of traces that might justify an analysis of trauma. A number of possible diagnoses are offered and each of them you might mark as 'alleged trauma' or 'similar traces'. This indicates your personal ideas on the traces observed. Choose the first option if you think the proposed interpretation might apply to traces on the skeleton. Mark as 'similar traces' if you think there is a potential for false conclusions drawn from the skeletal evidence. The following interpretations are offered:

TS II.1 Detailed
Examination
Considered

bending fractures Fracture surfaces indicate that breakage occurred while the bone still contained enough collagen to be elastic.

cut marks There are marks on the surface that might have been caused by a blade and are not obviously fresh (i. e. caused during archaeological excavation).

7 TS - Trauma Shortlist

fracture systems Fissures or fracture lines form radial and/or concentric patterns, suggesting external application of force.

depressions Depressions of the bone surface that might have been caused by external force.

impressions Depressions on the outside of the skull that are matched by an internal bulge.

penetrations Holes in the skull that might have been caused by violent impact.

internal bevelling Slanted fracture surfaces on skull fragments that might have been produced by penetration of the skull vault.

inflammation Traces of an inflammatory bone response that might have been a side effect of traumatisation.

other Any possible interpretation of traces that has not been specified above.

Explain all your decisions in section 'TS II.3 Description of Traces'.

The selection of interpretations that is offered here was developed during an analysis of cranial remains. Further propositions should be added to cover typical cases of trauma in other skeletal elements.

TS II.3 Description of Traces

Use the form TS-text to explain in coherent sentences why the skeleton might qualify for a detailed examinations of trauma. Make reference to all marks you have set in section 'TS II.2 Traces' and be particularly explicit if you ticked 'other'. This little text should remind you of your observations when sorting and finally assembling cases for a detailed analysis of trauma.

TS II.2 Traces

TS III. Documentation

TS III.1 Photographs Taken During Shortlisting

If you have taken snapshots during shortlisting, you can specify here what was documented. This will remind you later of existing pictures that might illustrate the records made in section 'TS II. Suspected Traumatisation'. The following options are offered as standards:

7 TS - Trauma Shortlist

trauma Traces that might be related to trauma.

taphonomy Taphonomic traces that might have obliterated parts of the evidence for trauma, hinder examination or might be mistaken as consequences of trauma.

green staining Colouring of the bone surface caused by copper or bronze grave goods.

inflammation Traces of inflammatory bone response, probably as a consequence of traumatisation.

archival storage Damage to the material caused during storage (e. g. by vermin or dampness) or any other issue related to the archive where the material is kept.

other Any other kind of motive. Specify in the grey box.

TS IV Remarks

TS IV.1 Remarks Concerning the Shortlisting Process

Use the form SK-text to give any comments on the trauma shortlist or its production.

Research Administration

At the bottom of the sheet there is a box with the following items, that are concerned with the administration of the examination process.

name Place your name here.

date started If you have started this form today, enter the date here.

date finished Enter the date on which shortlisting was concluded, i. e. forms for all individuals have been completed, a final selection of individuals has taken place and the detailed examination can begin.

8 TC - Cranial Trauma

A full analysis of trauma is carried out on all individuals that are on the Trauma shortlist, created by using the form TS - Trauma Shortlist. There is a checklist (TC-checklist) and a form for free specifications (TC-text).

TS - Trauma Shortlist

This form is intended to document traces of trauma on the skull. For other skeletal elements, use the form 'TP - Postcranial Trauma'.

TP - Postcranial Trauma

Administration of Trauma Analysis

These items are contained in the document header.

skeleton ID Copy the individual identification number given in the item 'skeleton ID' from the form SK - Skeleton.

skeleton ID

sheet Look up the sheet number within the documentation referring to the individual by checking with the last document therein and enter it here.

trace ID Register the form with the documentation relating to the skeletal population (cf. 'PO - Population') and enter the number both here and under 'SK IV.1 Diagnoses' on the form SK - Skeleton.

SK IV.1
Diagnoses

box Copy the archive reference given in the item '6' from the form SK - Skeleton'.

box

material In the empty room in the lower part of the box all forms should give the same catchwords describing the body of material as in item 'material' from the form SK - Skeleton'.

material

TC I. Localisation of Traces

This section is to document the exact position of the traces to be documented. To other researchers it should be quite clear what exact features are referred to and they should be able to locate them on the material for re-examination.

TC III.4.1
Location

TC I.1 Schematic Drawing

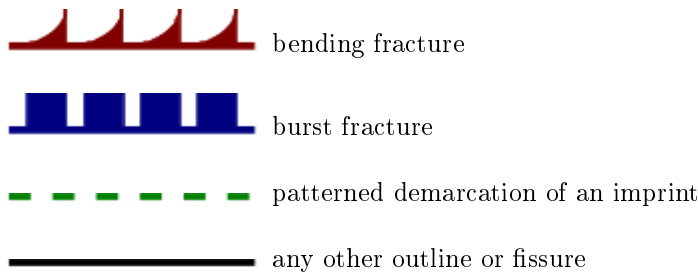
If at all possible, you should choose an appropriate template from section 'SD - Schematic Drawings' for sketching the traces to be documented in a schematic representation of skeletal elements. You may use several of these forms that show the skull from different views, but you should avoid this if possible, as it may lead to mistakes.

SD - Schematic Drawings

Tick 'no' if, for some reason, no sketch can be produced. Explain in section 'TC I.6 Remarks on Localisation'. Tick 'yes' if one or more schematic drawings are issued and enter their sheet numbers.

TC I.6 Remarks on Localisation

In the schematic representation, use a pencil to draw the outlines and other features of the traces to be documented. Use the following signatures to indicate qualities of features:



The colours give a more distinct picture of differences. If records are photocopied, however, the line patterns are still visible in black and white copies.

TC I.2 Bones

Tick all regions of the skull ('cranial vault', 'face', 'cranial base') that are affected by the traces to be documented. For 'cranial vault' and 'face', also specify the individual bones that are affected.

Fractures of the cranial base are often difficult to observe because of poor preservation. To simplify procedures, a coding of individual bones has not been implemented. Cases of cranial base trauma should be described in detail on a case-to-case basis.

TC I.3 Body Side

Specify which body side is affected. Tick 'right' or 'left' if this decision is obvious and 'central' if traces can be exactly located but cannot be assigned to either side. If traces cover large areas of both body sides or their exact location is unknown, tick 'not assessable'.

TC I.4 Area Code

Give the area codes according to the system used in 'SK II.2 Coding Preserved Areas' (form SK - Skeleton) that are affected by the traces to be documented . SK II.2 Coding Preserved Areas

As area coding is not yet implemented in the system, it has to be established for each examination, how these are to be recorded.

TC I.5 Description of Location

Use the form TC-text to describe in coherent sentences where the traces to be documented are situated on the skull. Measure distances to generally defined landmarks and add these to the sketch. In the text, make reference to these measurements and to the previous items in this section. TC I.1 Schematic Drawing

TC I.6 Remarks on Localisation

Give any further information on the localisation of traces, e. g. reasons why no sketch could be produced (cf. 'TC I.1 Schematic Drawing'). Use the form TC-text to write in coherent sentences.

TC II. Description

This section is predominantly concerned with what traces look like and only secondarily with what they mean. Try to put as little interpretation as possible into your descriptions. At the same time, however, keep in mind that all your assessments in section 'TC III. Interpretation' will have to draw on information you provide here.

TC II.1 Classification

Classify the general form of traces. There will be a similar classification item in section 'TC III. Interpretation'. Here, just assess the trace morphology without thinking of what diagnosis might turn out at the end of examination. Several options might apply, the following are on offer:

joint involvement Tick if traces touch or otherwise interfere with articular surfaces. Most categorised items in this form do not apply to luxations and their interpretation will strongly rely on free description.

flattening Parts of the bone surface are even and flat instead of rounded.

bulge Parts of the bone surface are elevated.

recess Parts of the bone surface are lowered to form pit-like structures.

impression A recess on the outer surface coincides with a bulge on the inner surface.

fissures Complete or incomplete discontinuity of the bone; all parts are well aligned so that only cracks are visible on the surface. If this type of trace is caused by trauma, it is sometimes referred to as 'infraction' but we do not use this terms, following Lovell (1997, p. 140, footnote 1).

rupture Complete discontinuity of the bone. This includes pieces that are split open but still adhere in some parts.

surface modifications Structures that mainly affect the bone surface but do not reach very deep. Traces of inflammatory bone response would be of this type.

other Traces that do not fit any of the previous categories.

Your descriptions in section 'TC II.4 Descriptions' should explain your motivations to chose these categories.

TC II.2 Discontinuity

Specify the degree of bone discontinuity. Tick 'not relevant' if there is no disruption at all, e.g. when describing just surface modifications. Keep in mind, however, that discontinuities might be covered up by bone remodelling during healing and might only be made visible using special analyses (e.g. x-ray). If you suspect such hidden discontinuity, tick 'not assessable'. This option also applies to all cases

where observation is hindered by poor preservation. If discontinuity is complete, also specify the alignment of fragments. The options 'well aligned' and 'displaced' only refer to healed fractures (some interpretation cannot be avoided here). 'Nonunion' applies to all cases where parts of bone are completely parted. However, this also implies when the fracture surfaces are still kept well aligned by other parts of the bone or the skeleton (e. g. if a bone is partly split but still intact in some area).

Your decisions here should be explained in section 'TC II.4.1 General Morphology'.

TC II.3 Measurements

The items in this section record measurements that might be possible to describe dimensions of the traces to be examined. If there are pairs of large letters before the item names, these distances are to be charted in the sketch made in section 'TC I.1 Schematic Drawing'. This is to insure a general understanding of what dimensions have been measured. Distances are given in millimetres and no measurement smaller than 1 mm should be recorded.

TC I.1
Schematic
Drawing

minimal number of fragments The number of fragments that were produced by traumatisation might be difficult to estimate, if parts of the skeletal material are lost. Also, with some fractures it might be disputable if they are a product of antermortem trauma or of taphonomy. Give the smallest feasible number of fragments here.

maximal number of fragments Give the largest feasible number of fragments produced by traumatisation.

external length The largest dimension of traces on the outside of the skull. If this measurement is possible, draw it as a line between the points A and B in the sketch ('TC I.1 Schematic Drawing').

external width The largest extension that can be measured othogonally to 'external length'. If this measurement is possible, draw it as a line between the points C and D in the sketch ('TC I.1 Schematic Drawing').

internal length The largest dimension of traces on the inside of the skull. If this measurement is possible and the endpoints show on the sketch ('TC I.1 Schematic Drawing'), mark them as E and F.

internal width The largest extension that can be measured orthogonally to 'internal length'. If this measurement is possible and the endpoints show on the sketch ('TC I.1 Schematic Drawing'), mark them as G and H.

clear length In perforations, clear dimensions are those measured on the opening as it would be seen if you hold the specimen up to peep through the hole. In most cases, there is no point in taking these, as they coincide either with the external or internal dimensions. They might be helpful, however, if there are extensive bevels on both surfaces or if internal dimensions cannot be measured, e. g. on perfectly preserved (and therefore closed) skulls. Clear length refers to the largest extension of clearance. If this measurement is possible, draw it as a line between the points I and J in the sketch ('TC I.1 Schematic Drawing').

clear width The largest extension of clearance that can be measured orthogonally to 'clear length'. If this measurement is possible, draw it as a line between the points K and L in the sketch ('TC I.1 Schematic Drawing').

ectocranial dent If there is a recess in the outer bone surface, measure its depth by placing a ruler over the lesion and taking the largest distance to the bottom, using the depth probe of a calliper gauge.

endocranial bulge If there is a bulge on the inner bone surface, measure its height by placing the base of a calliper gauge on its peak and taking the distance to the unaffected bone surface, using the depth probe.

It might be difficult to define the demarcations of traces or to decide if they are complete or partly obliterated by taphonomic processes. Explain all such uncertainties, and how you have approached them, in section 'TC II.5 Remarks on the Documentation of Traces'.

TC II.4 Descriptions

The free description of traces is done on two different levels (macro and micro, if you want). We have defined these two categories to enforce a thorough and precise routine of description. Also, some important interpretations are based on the morphology of fracture surfaces and edges, a fact that merits a separate discussion.

TC III.3.2
Imprint
patterned?
TC III.4.2
Angle of Impact

TC II.4.1 General Morphology

Use the form TC-text to describe in coherent sentences the overall form of traces. Point out distinctive parts and structures, variations of traces in different areas, and parts that seem to be lost to taphonomic processes. Incorporate all information given in the previous sections in your description. The text should explain the choices you have made there.

TC III.3.1 Type
of Force

TC II.4.2 Edges and Surfaces

Take a closer look at the fringes of traces. Describe the profile and structure of fracture surfaces and their edges. This should provide evidence for the assessment of the bone's elasticity at the time of fracture and the degree of wound healing. Describe the demarcations of traces and how well they are defined. This will be relevant for the reconstruction of the impacting object. For surface modifications, describe their microstructure. Use the form TC-text for descriptions in coherent sentences.

TC III.1 Traces,
TC III.2.1
Degree of
Wound Healing

These descriptions should motivate the categorisation of traces in section 'TC III.1 Traces' and will be relevant for the assessment of bone healing in section 'TC III.2.2 Reconstruction of Healing Processes'.

TC II.5 Remarks on the Documentation of Traces

Use the form TC-text for any further information on the description of traces, e. g. if technical problems were encountered or taphonomic traces make a clear description difficult.

TC III. Interpretation

TC III.1 Traces

In this section you are asked to classify the traces according to your ideas how they might have been created. These decisions are initial steps towards conclusions in following sections and should result from the description of the surfaces and edges of lesions in section 'TC II.4.2 Edges and Surfaces'.

TC II.4.2 Edges
and Surfaces
TC III.2.3 Time
of Infliction
TC III.3.1 Type
of Force

TC III.1.1 Fracture Types

The existence of bending fractures indicates that they developed while the bone was still (relatively) fresh. This is an important issue in the assessment of the time when the lesion was inflicted. Brittle fractures develop if the bone is dried out, ductile fractures are a consequence of the deformation of bone in wet soils. These are both taphonomic conditions that cannot be associated with trauma.

TC III.1.2 Cut Marks

Tick these options if you believe that traces were created by a sharp blade that cut into the bone rather than crushing it. 'Cuts' are narrow, linear traces left by a blade hitting the surface without cutting through the whole bone. If the edge of a bone fragment is cut off (i. e. 'faceted'), we call this a 'facet'. These traces are necessarily created by sharp force.

TC III.1.3 Loss of Substance

This refers to bone removed during or following traumatisation, for example if part of the cranial vault is chopped off by a sword blow. It does not refer to taphonomic loss of material. Loss of substance is, therefore, mainly an issue in healed wounds. In perimortal lesions, it might be difficult to assess if bone was lost in traumatisation or during burial. If such questions cannot be decided on the grounds of trace observation, tick 'not assessable' and explain in section 'TC III.6 Remarks on Diagnosis'.

TC III.1.4 Inflammation

Tick 'yes' if you see any traces of inflammatory bone responses. If there is a reason to suspect such traces, but their existence cannot be verified (e. g. due to obliteration by taphonomic traces), tick 'not assessable' and explain in section 'TC III.6 Remarks on Diagnosis'.

TC III.2 Temporal Development

In this section you assess when the infliction occurred in the individual's lifetime (or later).

TC III.2.1 Degree of Wound Healing

Based on the description of surfaces and edges of traces in section 'TC II.4.2 Edges and Surfaces', decide whether wound healing had begun or not and whether it was completed when the individual died. Discuss your decision in the next item, 'TC III.2.2 Reconstruction of Healing Processes'. The question is not relevant if you believe that traces do not have a pathological cause. If traces of healing might not be accessible, e. g. because of taphonomic obliteration, tick 'not assessable'. If you choose one of the last two options, explain your motivations in section 'TC III.2.2 Reconstruction of Healing Processes'.

TC II.4.2 Edges and Surfaces

TC III.2.2 Reconstruction of Healing Processes

Use the form TC-text to summarise in coherent sentences all evidence of wound healing or of the absence of such processes. Discuss the degree of information that traces offer and, if possible, estimate how long the healing process may have lasted. The text should explain your decision made in the previous item, 'TC III.2.1 Degree of Wound Healing'.

TC III.2.3 Time of Infliction

Assess whether the traces developed before or after the individual died. 'Perimortal' refers to an infliction shortly before, coincidental with or shortly after death. As dead bone retains similar fracture characteristics as fresh bone for a long time (years), classification cannot draw on the types of fractures (section 'TC III.1 Traces') alone. Also consider contextual evidence and any information on traumatisation and possible causes of death. If the evidence available is not sufficient to make a strong case for either decision, tick 'not assessable'. If you do not think that the traces are related to trauma, tick 'not relevant'. Explain your decision in the following item, 'TC III.2.4 Reconstruction of Time of Infliction'.

TC III.1 Traces

TC III.2.4 Reconstruction of Time of Infliction

Discuss your assessment of the time of traumatisation from the previous section, 'TC III.2.3 Time of Infliction'. Cover all the considerations suggested there and give information on how confident you are in your judgement.

TC III.3 Impacting Object

If the traces are caused by trauma, they are the consequence of force applied through an external object. In this context, anything that might have collided with the individual's body can be addressed as an object, including other living organisms and parts of the natural or built environment, like buildings, rocks or the ground. Also, the application of force is understood as relative. For the impact it is irrelevant, if the object moves towards the body (like in a weapon assault) or the body towards the object (like in fall). Important are the force applied, the modalities of the impact and the object's qualities.

TC III.3.1 Type of Force

Decide whether the traces were formed by the application of blunt or sharp force. 'Mixed force' applies to objects that have a cutting edge to cut into the bone (sharp force) while being bulky enough to also wedge it apart (blunt force). An example for such an object would be an axe or hatchet. In the case of sharp force, try to assign one of the following types of traumatization:

TC II.4.1
General
Morphology,
TC III.1 Traces

stab marks A pointed or double edged object has been thrust into the bone (also known as 'thrust marks').

cut marks The surface has been cut by a blade, but the lesion does not penetrate the whole bone (cf. 'cut' in section 'TC III.1.2 Cut Marks').

slash marks Part of the bone has been cut off by a blade or the entire bone has been cut in half (cf. 'facet' in section 'TC III.1.2 Cut Marks').

ballistic impact Traumatization was caused by a projectile.

If the traces are likely to be caused by trauma but do not allow to assess the type of force, tick 'not assessable' and explain in section 'TC III.3.4 Reconstruction of Impacting Object'. Tick 'not relevant' if the traces are not related to trauma or give secondary evidence (e.g. if caused by an inflammatory response). An assessment of the type of force will be essentially based on both the general form and pattern of fractures (cf. 'TC II.4.1 General Morphology') and their type (cf. 'TC III.1 Traces').

TC III.3.2 Imprint patterned?

If there is an imprint left by blunt force, tick 'yes' if its form is determined by the form of the impacting object. Of course, to recognize a patterned imprint, you will need to have an idea of the object's form. Without this knowledge it is often difficult to argue for this case, even if some demarcations of traces might look like object imprints. If the case is undecided, tick 'probable' and explain in section 'TC III.3.4 Reconstruction of Impacting Object'. If nothing hints towards the traces being patterned (or if you have decided for sharp force in section 'TC III.3.1 Type of Force'), tick 'no'. 'Not assessable' applies to cases where part of the traces are obliterated or unobservable for some other reason. The case for a patterned imprint should be backed up by the descriptions of the lesion's general shape and of the fracture demarcations in section 'TC II.4 Descriptions'

TC II.4
Descriptions

This section should receive a further option 'not relevant'.

TC III.3.3 Size Determination

With a patterned imprint, it is obvious that the size of the lesion is determined by the size of the impacting object. But even if the imprint's form does not reproduce the form of the object, its size might still depend on it - if the area of impact is small enough. If the object touches the skull on a larger area, however, the size of the lesion might be determined by the spherical shape of the skull that only exposes parts of the surface to the impact. Imagine a wooden beam dropping on someone's head. The skull surface will only be affected where the beam hits and the size of this area is determined by how far the beam sinks in. It probably would be larger with a heavier beam, but not with one that is just bigger. In such a case, tick 'by cranial vault'. If the size of the lesion is caused by the size of the object, tick 'by object' and 'not assessable' when the evidence does not support either of the other options. Explain in section 'TC III.3.4 Reconstruction of Impacting Object' why an assessment is not possible. 'Not relevant' refers to cases that are not related to trauma. Note, that unlike section 'TC III.3.2 Imprint patterned?' this one also applies to sharp force lesions.

TC III.3.4 Reconstruction of Impacting Object

Explain the categorisations made in the previous items and combine them into a discussion of the impacting objects. Try to be as specific as possible without getting too much into speculation. Use the form TC-text for writing in coherent sentences.

TC III.4 Impact

This section comprises all information on how the object acted on the body, the amount of force, the angle and location of the impact.

TC III.4.1 Location

Decide whether the traces were caused by direct or indirect trauma. Besides all other information that has been established, the position of the traces on the skeleton (cf. 'TC I. Localisation of Traces') and possible connections to other lesions (cf. 'SK IV.1 Diagnoses') will be important for this assessment. If not all traces are observable, e. g. because of taphonomic obliteration, tick 'not assessable'. Choose 'not relevant' if you do not believe that the traces were caused by trauma.

TC I.
Localisation of
Traces
SK IV.1
Diagnoses

TC III.4.2 Angle of Impact

If you do not think that the traces were caused by trauma, tick 'not relevant'. Otherwise, use the form TC-text to describe in coherent sentences all evidence for the angle at which force was applied. This discussion should draw on the description of the general form of traces and, especially, its surfaces and edges (cf. 'TC II.4 Descriptions').

TC II.4
Descriptions

For skull trauma, an estimation of the direction in which force was applied could be expressed in two angles (horizontal and vertical). Measurements are complicated, especially because the skull has to be brought in some normed position (e.g. Frankfurt Horizontal). Still, a respective item would be a good addition to future versions.

TC III.4.3 Reconstruction of Impact

Use the form TC-text to summarise in coherent sentences the information from the previous items. Assess how the angle and the location at which the object hit the skull affected the formation of traces. Point out possible connections with other lesions (e.g. direct and indirect trauma caused by the same incidence of traumatisation).

TC III.5 Circumstances of Infliction

This is the final round of interpretation, resulting in the final diagnosis.

TC III.5.1 Deliberateness

Decide whether traumatisation resulted from an act of violence ('inflicted by others') or was accidental. If this is impossible, tick 'not assessable'. The assessment will be easiest for sharp force trauma that is often caused by weapons (cf. 'TC III.3.1 Type of Force'). However, there might also be accidents involving sharp objects. If you do not think that the traces were caused by trauma, tick 'not relevant'.

TC III.5.2 Classification

This is the final diagnosis for this lesion. Tick the category that describes best your conclusions. Diagnoses in normal typeset are sub-categories of a more generic term.

not assessable Try not to use this option if at all possible.

taphonomy The lesion has been caused sometime after the burial of the material and this examination. 'Excavation artifacts' are damage caused during the scientific (or non-scientific) recovery of the material, 'laboratory artifacts' during osteological examination.

postmortal treatment Any intentional modification of the body after death and before burial, e. g. as part of mortuary practice.

antemortem treatment Any body modification during the individual's lifetime that was consciously planned and served some medical or ritual purpose (e. g. trephination).

anatomic variant Body features within the natural variation. There is no pathological affliction. 'Systemic effect' applies if the traces are caused by processes that regularly occur in healthy individuals and, therefore, are not strictly pathological (e. g. ageing).

secondary effect The traces are not directly related to trauma but secondary consequences of traumatisation (e. g. inflammation).

other pathology The traces are pathological but not related to trauma. The individual might be listed for some other kind of examination.

trauma The traces have been caused by traumatisation.

trauma-surface cut The surface has been cut by a blade, but the lesion does not penetrate the whole bone (cf. 'cut' in section 'TC III.1.2 Cut Marks'). Note that only ante- or premortem traces apply. Cuts from defleshing the bones as part of mortuary practices would be diagnosed as 'postmortem treatment'.

trauma-chop cut Part of the bone has been chopped off with a blade.

trauma-slashing wound Sword blows and similar wounds resulting from hacking with large blades.

trauma-stab/thrust Thrust wounds caused by pointed and/or double-bladed objects. Often the distinction from ballistic weapons and other projectiles might be impossible.

trauma-projectile Lesions caused by projectiles.

8 TC - Cranial Trauma

trauma-fracture Any breaking of bones, including fissures and other incomplete fractures.

trauma-flattening Flat and even areas of the bone surface as a consequence of blunt force trauma.

trauma-depression Recesses of the bone surface caused by blunt force trauma.

trauma-impression Depressions on the skull that also caused a bulge on the inner side of the cranial vault.

trauma-perforation Holes in the cranial vault caused by traumatisation. Tick 'fitting piece' if the piece of the skull, that was stamped out in the process, is present in the material.

The list will always be under construction. Currently the following incoherences should be removed:

- In the distinction of 'surface cuts' and cuts as 'postmortal treatment' it is not quite clear what would be the generic form.
- The distinction between 'chop cut' and 'slashing wound' is not clear. The option 'chop cut' should probably be dropped.
- 'Perforations' might also be 'projectile' or 'slashing wounds'. The classification should be unambiguous.

TC III.5.3 Fatality

With skeletons it is impossible to find out about the cause of death as only a fraction of pathological aspects can be assessed. Perimortal lesions (cf. 'TC III.2.3 Time of Infliction') have not been survived but this does not imply that they lead to the death of the individual (actually, they might have been inflicted when the victim was dead already). Here, decide for traces of perimortal trauma, if the lesion would have caused the individual's death even in the absence of any other harm ('fatal') or if survival could have been possible ('not fatal'). Tick 'not assessable' if this assessment is impossible for lack of evidence or because part of the traces has been obliterated. Tick 'not relevant' if traces are not indicative of perimortal trauma.

TC III.2.3 Time of Infliction

TC III.5.4 Reconstruction of Infliction

Use the form TC-text for a summary of all results from the examination in coherent sentences. Cover traumatisation, the recovery from it and possible consequences. This text should be an autonomous piece of information that could be understood by others even without the rest of the documentation.

TC III.6 Remarks on Diagnosis

Give any information on the modalities of the examination, of problems encountered and how these have been approached. Use the form TC-text to write in coherent sentences.

TC IV. Further Analyses

Use this section to mark the individual for special Analyses (e. g. radiography). The need for such additional treatment usually arises during examination and for logistic reasons they will be carried out after all individuals have been assessed.

In future versions, there should be special forms to record evidence from the special analyses indicated here to be included in the individual documentation.

TC IV. Types of Analyses

Specify which further treatments are needed. At the moment only 'x-ray' scanning is offered as a generic option. Tick 'other' if any other analysis is needed and specify in the following section, 'TC IV. Specifications'.

TC IV. Specifications

Use the form TC-text to give detailed instructions what kind of treatment should be carried out on the specimen.

Research Administration

At the bottom of the second page there is a box with the following items, that are concerned with the administration of the examination process.

8 *TC - Cranial Trauma*

name Place your name here. Several names might be given, if different researchers carry out various kinds of examinations and update the section 'SK IV. Synthesis' in turns.

date started If you have started this form today, enter the date here.

date finished When all types of analyses have been conducted on the skeleton and the examination concluded, enter the date here.

9 TP - Postcranial Trauma

Until now, the documentation system has mostly been applied in an examination of cranial trauma. As a consequence, the form dedicated to postcranial trauma is much less developed and still in the state of version 1. It would not take much effort, though, to bring it up to current standard. The differences to the cranial form are mostly concerned with measurements ('8') the types of fracture ('8') and the categorisation of diagnoses ('8'). There is still a point in keeping up both forms as some items applying to cranial trauma (such as impressions) might be confusing in a form on other skeletal elements and vice versa.

If input will be organised in a data base, however, both trauma forms will, of course, feed one and the same table to facilitate comparisons of the common items.

10 SD - Schematic Drawings

A number of line drawings is provided to sketch pathological lesions on the skeleton. Each drawing represents a skeletal element from a certain angle. As the documentation system has been mostly applied in an examination of skulls, only views of the cranium are available so far. Good representations of postcranial elements can be found in the 'Human Skeletal Remains Checklist' issued by the Arizona State Museum¹. The following views are currently included:

- Cranium, frontal view (SD-CraniumFrontal.pdf)
- Cranium, seen from the left (SD-CraniumLeft.pdf)
- Cranium, seen from the right (SD-CraniumRight.pdf)
- Cranium, dorsal view (SD-CraniumDorsal.pdf)
- Cranium, seen from above (SD-CraniumSuperior.pdf)

Administration of Sketches

Just like all other examination forms, schematic drawings are registered with the following information. These items are contained in the document header.

skeleton ID Copy the individual identification number given in the item 'skeleton ID' from the form SK - Skeleton. skeleton ID

sheet Look up the sheet number within the documentation referring to the individual by checking with the last document therein and enter it here.

trace ID Copy the identification number of the traces to be examined from the respective examination form (e. g. TC-checklist).

¹http://www.statemuseum.arizona.edu/crservices/burial/hum_rem_inventory.pdf, last accessed on 5 Jan. 2011.

10 SD - Schematic Drawings

box Copy the archive reference given in the item 'box' from the form SK - Skeleton'. box

material In the empty room in the lower part of the box all forms should give the material
same catchwords describing the body of material as in item 'material' from the
form SK - Skeleton'.

Part III

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