Based on demographic developments in the coming years, ca. 1/3 of Germany’s population will be over 60 years old in 2030. Today, the German and European population pyramid no longer has a wide base, as it did at the beginning of this century. Rather, it resembles a mushroom with a thin stem and a wide cap. As a consequence, dentistry and medicine are in transition in order to adapt to the new situation. The importance of geriatric dentistry is growing and will continue to grow in the next several years. This paper will show that in the treatment of the elderly, it will be increasingly necessary to emphasize interdisciplinary cooperation between medical care professionals and various fields of dentistry.

The following are general prerequisites to the medical treatment of the elderly:

1. Knowledge of anatomical and physiological changes with advancing age.
2. Insight into the social circumstances of the elderly; the dentist must be able to understand the mental and physical situation of older people and recognize their daily problems.
3. Recognition of other circumstances that influence the health of the elderly, especially oral and dental hygiene.
4. Familiarity with the care/medical care of old people.
5. Familiarity with the institutions which deal with the elderly
6. Knowledge and recognition of interactions between the most frequent diseases and oral health of the elderly
8. Fundamentals of geriatric nutrition and its effects on the body.
9. Familiarity with handling a patient’s physical handicaps (wheelchair, helping into dentist’s chair, out of bed, etc.).
10. Awareness that the dentist is part of an interdisciplinary team.

This paper addresses only a few of the points listed here. For further study, reference volumes and lectures are recommended.

Legal aspects geriatric dental treatment

To treat geriatric or handicapped patients, the following requirements must be legitimizened and met:

1. An indication for treatment is necessary. If a treatment is conducted but was not therapeutically indicated, this legally constitutes assault. The right of the patient to self-determination is not sufficient grounds for treatment; the professional codex must always be kept. The patient must always be informed about the degree of urgency of the indication, alternatives, and the costs.
2. In order to conduct treatment, the patient or his representative must give legal consent. If the patient’s ability to give consent is impaired, the supervisory caregiver law takes effect, giving due regard to the patient’s wishes as far as it is possible. In this case, the role of the supervisory caregiver cannot simply be assumed by the dentist, the care facility’s personnel, or an arbitrarily chosen relative; rather, the caregiver must be legally appointed as such.

3. The dentist must possess the required qualifications.

**General anatomical changes in the aged**

At the beginning of this century, the life expectancy of the population was approximately 50 years, and people tended to die without going through a long period of senescence first. Today, life expectancy is approximately 80 years, and in contrast to 100 years ago, death is often preceded by a lengthy period of deterioration. The elderly suffer greatly from chronic problems, such as Alzheimer’s and Parkinson’s disease, cancer, coronary diseases, aches and pains, shortness of breath, reduced functioning of organs, changes in the immune system, depression, and weight loss. Normal aging affects all people. It is progressive, irreversible, and genetically determined. From age 25 on, a biological transformation takes place in the human body. Some of the most important anatomical changes are briefly given here:

- **Immune system**: age-dependent, selective failure of immune capacity. An increase in auto-antibodies occurs through failure of the suppressor function of the thrombocytes. Consequence: Frequent appearance of allergies.

- **Skin**: Reduced epithelial cell turnover resulting in reduced cell replacement and loss of thickness. Splitting and disintegration of the elastic fibers, relative increase of collagen fibers, very slight decrease in water content.

- **Heart**: There is no heart atrophy; heart weight remains the same. It shows an age-dependent fibrosis. The number of mitochondria in the cardiac muscle cells decreases and their size increases with increasing age and vice-versa.


- **Lung**: Changes in fibrous tissues affecting lung volume, respiration dynamics, lung perfusion, and gas-exchange surface.

- **Kidney**: Increase of collagenous connective tissues, decrease of kidney parenchyma. Number of glomeruli decreases with simultaneous enlargement. Consequently, there is no essential loss of function.

- **CNS**: Cell loss with advancing age, weight loss from 4th decade on, decreasing neuronal density. Geriatric brain disease: senile and presenile dementia with dystrophic and atrophic processes leading to multiple clinical symptoms.

- **Pain sensation**: Not every irritation of the pain fibers leads to pain sensation; primarily,
initiate defense reflexes. If that is not enough, the alarm signal — pain — goes off. Pain sensation is dependent on temperature, circulation, and chemical status of the irritated locus. A habituation process in pain attacks is observed.

- Cartilage: Few age-typical alterations. Increase in collagen fibers, mineralization, decrease in ground substance, demarcation of fibers, decrease in water content only in intervertebral discs.
- Bones: Decrease in compact and cancellous bone (less important trabecula disappears), reduction of the bone matrix = osteoporosis. Neither calcium nor androgen deficiency are responsible - but rather a complex disturbance of homeostasis with elevated bone reabsorption.
- Musculature: Atrophy on the basis of reduced function.

**How teeth age**

*Changes in enamel:*
- Color change, teeth become yellow to yellowish gray, yellowing of the roots
- Cracks appear
- Wear, abrasion, exposed dentin
- Lower solubility when etched in comparison to young teeth
- Increased demineralization, less remineralization
- Increased transparency
- Altered approximal contacts

*Changes in dentin:*
- Change of collagen fibers (very useful in determining age)
- Decreased permeability
- Dentinal canals become narrower
- Pigment deposits
- Sclerotization

*Changes in the pulp:*
- Alteration of cell structure
- Decreased number of collagen fibers
- Innervation: the elderly have more of the slow C-fibers
- Calcification
- Reduced sensitivity
- Obliteration of root canals
- Shrinking of the pulp cavity

**Effects of general illnesses on the oral cavity**

*Diabetes Mellitus*
- No typical histological appearance
- Secondarily observed mucous membrane alterations
- Leveling of tongue topography
- Increased tendency toward mucous membrane inflammations (ulcerous stomatitis with compromised ability to heal)
- Increased circumscribed leukoplakias of the buccal mucous membrane with superficial keratoses
- Apparent hyperemia of the lingual mucous membrane (cause: Randon acid, peels off superficial callus)

**Cardiovascular disease**
- Right ventricular failure can lead to congested tongue (violet-cyanotic mucous membrane discoloration, volume increase)
- Left ventricular failure (brick-red discoloration without volume increase)

**Liver disease**
- Disappearance of the papillae filiformes
- Smooth lingual surface with slight hyperkeratosis, almost no tongue coating
- Moist, dark red tongue

**Diseases of the hemapoietic system**
- Acute leukemia: swelling, hemorrhage, necroses, ulceration, partially with tissue degeneration at the gingival margins and palate
- Agranulocytosis: deep, crater-shaped, smear-floored ulcerations in the gingiva and palate.

**Diseases of the gastro-intestinal tract**
- Chronic, recurrent aphthas

**Occurrence of allergies**
- Frequent diagnoses: increased rate of mercury, nickel, cobalt, and amalgam allergies
- Mechanically or bacterially caused prosthesis intolerance
- Side-effects of medications observed to cause intolerance reactions.

**Dealing with elderly patients**

Fundamentally, dealing with ill elderly people does not differ from dealing with those in good health. Any existing physical handicaps or behavioral disturbances are taken into consideration, including the elderly patient’s personality idiosyncrasies resulting from such problems. Thus, difficulties with adapting in advanced age should not be judged as signs of inflexibility and unwillingness to cooperate. Adaptability problems are in part based on reduced physical and mental robustness, lessened perceptive acuity, daily inconveniences, and timidity. But most elderly people are sufficiently adaptable in spite of such drawbacks; they often need just a little more time than younger people. The medical caregiver and assistants – if they are not encumbered by the prejudice “old = sick + falling apart” – must respect the legitimate wishes, needs, and rights of the elderly patient, as well as his or her individuality, experiences, and maturity. If the doctor has the necessary patience with her/his elderly patients, s/he can reckon with better adaptability on the part of the patients. Particularly where there is a considerable age difference between professional caregivers and patient, the much younger doctor and assistants must be able to
the older patient’s wishes and behaving like know-it-alls. Conversation, diagnostics, and
treatment in geriatrics cannot be carried out while trying to save time; cutting time con-
sumption leads to misunderstandings and no success whatsoever.
As gerontological experience has shown, the older person is ready and willing to accept
therapeutic procedures if these enable him or her to continue living contentedly, free of
complaints and fear, mentally and physically comparable to her or his peers. In this re-
spect, normality in advanced age is defined as how the individual compares to the average
condition of those her/his age.

**Dental treatment of the older patient**

The examination up to diagnosis does not differ from that in younger patients. During the
examination, the operator must take care not to hastily criticize the treatment measures
implemented by other, older colleagues. It is possible that the criticized prosthesis or filling
done earlier was the scientific standard of its time, with which the patient was perhaps
completely satisfied. Particularly in reaching a diagnosis, the current dentist should not just
conduct a superficial examination. In the oral cavity, there are often symptoms of disease
which other doctors have not yet noticed. Due to superficial diagnoses, caries, periodontal
disease, and particularly diseases of the oral mucosa are often overlooked. As is well
known, the latter can be indicative of severe illnesses, which can be easily treated in the
initial stages. Here, close cooperation is necessary with the general practitioner, who can
support the given treatment. The treating physician /dentist must be prepared for special
diagnostic problems. For example, a vitality test of an aged tooth may yield false results,
considering that the pulp recedes with advancing age.
Panoramic radiographs have proven exceptionally useful in geriatric dentistry, insofar as
one requires overviews of the gnathic system and dentition for the overall planning of
prostheses. The long running times of the film cassette and x-ray source are disadvanta-
geous, especially in patients who cannot fully control their motoric activity; this can pro-
duce unusable results.
The treatment plan depends on the wishes and ideas of the patients (and their family), the
general practitioner, internist, and upon what the dentist considers realistic and attainable.
Often, this unavoidably amounts to adequate but not optimal care.
The healthy and vital patient can expect an extensive restoration of esthetics, speech, and
chewing function. S/he is in a position to bear the strain of comprehensive dental treat-
ment.
Rather frequently, active and assertive female patients want not only the maintenance of
their own teeth, but even improvement and rejuvenation by way of prosthetics. Such high
expectations are also held by members of the patient’s family. The dentist is confronted
with the difficult task of politely yet unambiguously explaining the limitations of the treat-
ment in question.
With reduced general health, s/he lives with the idea that “it’s not worth it anymore,” and is
sceptical of comprehensive treatment, although s/he might still be up to it. The dentist is
often suspected of wanting to conduct treatment only for financial reasons. In this case, it
is advised to proceed with discretion. Only if the patient her/himself desires prosthetic

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If the general condition of the patient is very poor, if the patient is senile or even bed-
ridden, his or her wish will usually focus on relieving pain and facilitating speech and the
uptake of nourishment. Dentistry then becomes an aspect of nursing, in which every
measure is indicated which contributes to the well-being of the patient. This especially ap-
plies to oral hygiene, which is usually sadly inadequate, since the patient cannot clean his/her own teeth and does not see the plaque.

If patients are in very poor general condition (nursing home), your work as a dentist can fail due to lack of communication and cooperation. In order to relieve pain, urgently required surgical or restorative measures must be conducted. Even under difficult bedside conditions, the existing dental prosthesis can usually be improved enough so that it does not cause damage in soft or hard tissues.

### Recommendations for treatment planning

<table>
<thead>
<tr>
<th>Oral conditions</th>
<th>General condition reduced</th>
<th>Oral hygiene</th>
</tr>
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<tr>
<td>Stomatological System without severe damage</td>
<td>Surgical treatment, caries and PA therapy, crowns</td>
<td>Oral conditions, caries and PA therapy? crowns?</td>
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<td>Missing teeth, resistant</td>
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<tr>
<td>Missing teeth, PA-damaged, incomplete dentition</td>
<td>Connecting bar, resilience telescope, cast prostheses</td>
<td>Connecting bar?, Resilience telescope?, cast prostheses?</td>
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<tr>
<td>edentulous</td>
<td>Full denture</td>
<td>Full denture, reconstruction of denture</td>
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### Oral hygiene

The usually positive answers older patients give when asked about their oral hygiene habits must often be considered as an attempt to save face. The willingness to perform thorough oral hygiene is in obvious opposition to the real situation. This is not solely due to inadequate use of oral hygiene products and devices; rather, the greater cause lies in ignorance of the most basic relationships between nutrition and periodontal disease.

In an interdisciplinary study with an eye clinic, it was proven that the age-related physiological alterations causing ebbing manual dexterity and suboptimal vision have a much smaller influence on the oral- and prosthetic hygiene in regularly motivated and instructed geriatric patients than was previously thought. According to results from our own investigations, this does not apply to patients with severe general diseases. Among reconvalescent patients, oral- and prosthetic hygiene is inadequate in ca. 50 % of the seniors.

The increased occurrence of caries and periodontal disease is observed in older patients at:

- Retention sites of complex clamps or fixed prostheses, trauma sites
- Conventional predilection sites and in the root-cement area
- sites at the junction of prosthesis and tooth.
Thus, especially intensive instruction in and monitoring of oral hygiene after the placement of any dental prosthetic is of utmost importance not only in older patients; otherwise, broad demineralization and periodontal damage will occur within a very short time, making further treatment necessary. The following preventive steps are recommended:

- Stain plaque with appropriate dyes to visualize inadequate brushing
- Demonstrate a suitable toothbrush as well as practical brushing techniques
- Emphasize hard-to-reach areas
- Set times for daily tooth care; rinse the mouth with a water jet after every meal
- Show easily comprehensible analogies for illustrating the reason for the roll-off brushing technique (radiators, comb for vertical brushing technique, etc)
- Time toothbrushing with a 3-minute hourglass.

If the patient cannot carry out oral hygiene measures on his/her own, the nursing staff should be instructed. Oral hygiene steps should be monitored and performed by the nursing personnel at least twice a day. Mouthrinses should only be used after toothbrushing as a supplement to it. This is because mouthrinses alone cannot adequately remove the remains of sticky food from the teeth. It is urgently recommended that a monitoring and recall system be introduced for older patients every 3-6 months.