



## DEVELOPMENT OF A UNIQUE GERIATRICS CURRICULUM FOR NON-GERIATRICIAN FACULTY IN TURKEY

### ABSTRACT

**Introduction:** The purpose of this study was to describe the geriatric training initiatives implemented as a part of faculty development in geriatrics in Ondokuz Mayıs University in 2005 and to evaluate the resulting structure, processes and outcomes.

**Materials and Method:** The project was composed of: 1) Improving and enhancing the learning objectives according to the nuclear education program of medical schools in Turkey; 2) Implementation of the geriatrics block; 3) Evaluation of the outcome by feedbacks provided by 10 tutors and 78 students.

**Results:** In accordance with the 71 learning objectives, four PBL (Problem based learning) sessions, eight presentations and two clinical skills laboratory sessions were constructed. All learning activities were evaluated by feedback forms filled on a voluntary basis. Ethics presentation was found to be significantly superior in terms of clear definition of the objectives ( $p=0.006$ ). Three of the scenarios were functional in terms of the evaluation criteria. The first scenario was evaluated as defective in terms of learning what to know ( $p=0.007$ ), finding sufficient sources of information ( $p<0.0001$ ), and general evaluation ( $p=0.008$ ) by the students and by tutors ( $p=0.03$ ).

**Conclusion:** For countries like Turkey which have limited resources for geriatric departments, our study may be a template to develop geriatric curricula.

**Key Words:** Geriatrics; Education; Medical; Undergraduate.

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## TÜRKİYE'DEN, GERİATRİ BÖLÜMÜ OLMAYAN TIP FAKÜLTELERİ İÇİN ÖZGÜN BİR GERİATRİ MÜFREDATI ÇALIŞMASI

### Öz

**Giriş:** Bu çalışmanın amacı Ondokuz Mayıs Üniversitesinde 2005'te oluşturulan geriatri müfredatını ve sonuçta oluşan yapının, sürecin ve sonuçların değerlendirilmesini anlatmaktadır.

**Gereç ve Yöntem:** Bu proje:1) Öğrenme hedeflerinin Tıp Fakülteleri Ulusal Çekirdek Eğitim Programı'na göre genişletilmesi ve geliştirilmesi, 2) Geriatri bloğunun gerçekleştirilmesi, 3) On eğitici ve 78 öğrenciden alınan geribildirimlerin değerlendirilmesi bölümlerinden oluşmaktadır.

**Bulgular:** Yetmişbir öğrenme hedefine göre sekiz probleme dayalı öğrenim (PDÖ) oturumu (dört senaryo), sekiz sunum, iki klinik beceri seansı yapılandırıldı. Tüm öğrenim aktiviteleri gönüllü doldurulan geribildirim formlarıyla değerlendirildi. Etik sunumu öğrenim hedeflerinin açıklığı açısından diğerlerine üstün bulundu ( $p=0.006$ ). Üç senaryo, değerlendirme kriterleri açısından fonksiyonel bulundu. Birinci senaryo, neyi öğreneceğini bilmek ( $p=0.007$ ), yeterli kaynağa ulaşmak ( $p<0.0001$ ) ve genel değerlendirme( $p=0.008$ ) açılarından öğrenciler ve eğiticiler ( $p=0.03$ ) tarafından eksik bulundu.

**Tartışma:** Çalışmamızın Türkiye gibi sınırlı kaynağa sahip ülkeler için geriatri müfredatı oluşturmada bir şablon görevi görebileceğini düşünüyoruz.

**Anahtar Sözcükler:** Geriatri; Eğitim; Tıp; Mezuniyet Öncesi.

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## INTRODUCTION

A recent International Institute on Aging (INIA) report indicated that, by 2050, 20-24% of the Turkish population will be older than 60 years of age (1). This provides an impetus to Turkish medical schools to train students on the needs of an aging population.

As the population grows older, medical professionals need to improve their ability to cope with elderly patients. In 2000, physicians spent an estimated 32% of patient care hours for the population aged 65 years and older. If current consumption patterns continue, this may increase to 39% by 2020 (2). Thus, undergraduate medical students to should be prepared for geriatric health care issues by gaining knowledge, skills and attitude with a structured curriculum.

Recent studies show that England, USA and Japan are trying to standardize the geriatric undergraduate education in accordance with the core competencies suggested by their geriatric committees. In May 2004, The European Academy of Yuste Foundation working party on the need for education in geriatrics in Europe published 13 competencies for undergraduate geriatrics education (3). In May 2004 Walpole et al. from New York suggested integrating an aging theme into an undergraduate medical school curriculum (4). In 2004 British Geriatrics Society has published "The Medical Undergraduate Curriculum in Geriatric Medicine" and defined learning objectives in terms of knowledge, skills and attitudes (5). In 2005, by surveying all allopathic and osteopathic medical schools in the US, Eleazer et al. reported that the geriatric content of the curriculum has increased between 1999 and 2000 (6). In a study from Japan comparing Japanese curriculum with that of other industrialized countries including the United Kingdom, it was found that introduction of practical aspects of management and care of the elderly was essential (7).

## MATERIALS AND METHOD

Ondokuz Mayıs University School of Medicine is in the city of Samsun which is located at the middle north region of Turkey. Medical education in this school started in 1973, and it gave its first graduates in 1979. During 30 years, more than 4000 doctors graduated from Ondokuz Mayıs University School of Medicine. Approximately, 200 doctors graduate from the school of medicine each year. The faculty used an "integrated system" in medical education between 1973 and 2003. After 2002, the faculty decided to use a student centered model and developed a new program according to the national core curriculum for medical education. Problem based learning (PBL) is the basis of the new curriculum and it was introduced in 2003-2004 academic year (8). There were

no structured geriatrics modules or blocks in the previous curriculum. According to the world's changing needs, the program committee inserted a four week block in the third pre-clinical year (first 2005-2006) in order to provide a basis for comprehensive geriatric assessment at the primary care. Another aim of constructing this block was to promote multidisciplinary studies and to create awareness on geriatrics in a faculty without an independent geriatrics department.

In this article we will describe how the curriculum process was established and how the curriculum was implemented and report the results of the short term evaluation of the process. We used the outline for writing curriculum development journal articles: The IDCRD format: Introduction, Development process, Curriculum, Results, Discussion (9). The study complied with the declaration of Helsinki and was approved by the local research ethics committee.

## Development Process

The curriculum program committee at Ondokuz Mayıs University inserted a 4-week block on geriatric medicine into the third preclinical year. The committee followed the "10-step model to winning the geriatric game" devised by Walpole appointing captains and coaches as leaders for the change process (4). Because Ondokuz Mayıs University did not have a geriatrics department, the curricular team was led by two assistant professors from the Department of Physical Medicine and Rehabilitation and the Department of Family Medicine, together with a multidisciplinary committee from 15 diverse specialties. Both executives took a "Geriatrics and Gerontology" course given by Turkish Geriatrics Society in collaboration with INIA and the assistant professor of Family Medicine took a "Curriculum Development and Evaluation Course" given by Mark Gelula from the Medical Education Department of Illionis University/Chicago/USA.

Guided by the main learning objectives, we defined a main theme appropriate for the preclinical years involving the aging mechanisms of each system by enhancing the core competencies (Table 1) offered by the Turkish nuclear education program and defined the learning objectives (Acknowledgment I). The resultant Ondokuz Mayıs undergraduate geriatric medicine curriculum was then compared with the British Geriatrics Society's medical undergraduate curriculum in geriatric medicine. In 2005, the program committee approved the final version of the geriatric medicine block's learning objectives, thus enabling us to take the final step on deciding which scenarios and presentations to include in the block according to the objectives developed.

Four PBL sessions were designed, with scenarios based on the following systems: first urogenital system, eye disease, ear,



**Table 1—** Core Competencies Suggested by the Nuclear Education Program of Turkish Medical Schools

1. What is the genetic basis of aging?
2. What are the principles of safe living in the geriatric period?
3. Which health care problems increase with aging? (cardiovascular, pulmonary, urology, oncology, etc)
4. What are the essential nutrients in the diet of elderly?
5. What are the memory problems in the geriatric period?
6. What are the ethical principles of geriatric patient management?
7. What are the psychiatric problems of the elderly?
8. What are the problems specific to older patients from a public health perspective?

nose and throat diseases, pulmonary diseases; second obstetrics and gynecology, musculoskeletal system, dietetics; third cardiovascular system and gastroenterology, and fourth nephrology and neurology. The remaining objectives consisted of lecture presentations in genetics, endocrinology, immunology, public health, ethics, psychiatry and pharmacology. Additionally, during clinical skills training the committee instituted trainings on interview techniques and the physical examination of elderly patients for comprehensive geriatric assessment.

### Curriculum

The curriculum consisted of four PBL sessions, eight presentations and one clinical skills laboratory session. The block committee approved 71 learning objectives.

There were enough independent learning periods for students to use the library and the Internet in the learning resources center.

After the completion of the first block we tested the competency of the students using 2 assessment approaches:

1. Knowledge from presentations and PBL sessions (multiple choice questions)
2. A structured oral examination of interview techniques with an elderly patient

A week in the schedule could be regarded as a unit of instruction. For a scenario, the first session was on Monday and the second session was on Friday. In between, there were self directed learning periods, presentations, and clinical skills sessions.

We used SPSS 13.0 to process the data. Kruskal Wallis analysis was used to compare four scenarios according to the parameters seen in Table 2, and post hoc analysis was done by Dunn test. We used MannWhitney U test for comparing the two presentations' feedbacks.

### RESULTS

On May 2006, the curriculum was implemented in accordance with the geriatrics block schedule. The four PBL scenarios and eight presentations were performed. After the completion of the educational activities, feedbacks were taken from volunteers. The clinical skills laboratory provided doctoring courses on interview techniques and the physical examination of the elderly.

The PBL performance of the students was assessed by the PBL evaluation form containing 20 items (such as "coming to the session on time", "attendance", "productivity of the independent learning period", etc.) which measures the performance of the student, and which was filled out by the facilitators. This accounted for 20% of the final block performance. The remaining 80% of the points taken from the multiple choice examination was added to this value. Finally the total performance was evaluated; they needed to score a minimum of 70 points out of 100 points.

As a result 15.4% of the students got an AA (4.00), 15.4% got a BA (3.50), 28.2% got a BB (3.00), 21.8 % got a BC (2.50) and 16.7% got CC (2.00), and 2.4% failed (The mean was  $2.95 \pm 0.65$ ). Performance on the interview and the physical examination technique were evaluated by a structured oral examination in which all (100%) the students were successful.

Scenarios, presentations and the clinical skills sessions were evaluated separately with different feedback forms designed for the structure of the activity by the students. Content evaluation was done according to the Likert scale (1-5) and general evaluation was done by analogous scale (1:bad-10:excellent)

The students' feedback rates for scenarios were as follows:

- 1<sup>st</sup> scenario: 29/78 (37%)
- 2<sup>nd</sup> scenario: 26/78 (33%)
- 3<sup>rd</sup> scenario: 19/78 (24%)
- 4<sup>th</sup> scenario: 4/78 (5%)

The student feedback rates for presentations were as follows:

- The genetics presentation: 12/78 (15%)
- The ethics presentation: 14/78 (18%)
- the others: none

Not all of the scenarios were considered to be realistic ( $p < 0.05$ ) The differences between 1-4 and 2-4 scenarios were responsible from this result. Most students think that the time period to digest the scenario was adequate ( $p > 0.05$ ), and the upcoming data was sufficient to reevaluate the hypothesis ( $p > 0.05$ ). However, access to references ( $p > 0.05$ ), and ability to solve the problem with previous knowledge ( $p > 0.05$ ) were

**Table 2—** Student Feedbacks to Scenarios

	Scenario-1	Scenario-2	Scenario-3	Scenario-4	p
1. Structured realistically	4.45±0.63	4.04±1.18	4.65±0.59	4.86±0.36	<b>0.001</b>
2. Was interesting	3.52±1.24	3.77±1.18	4.15±0.59	4.09±0.82	0.219
3. Lets to achieve different hypothesis	3.52±1.12	3.69±1.12	4.15±0.59	3.91±0.61	0.149
4. Reevaluation opportunity with the new data	3.83±1.04	3.88±0.99	4.00±0.65	4.17±0.62	0.602
5. Data given in the appropriate rank	3.61±1.29	4.00±0.98	4.30±0.80	4.17±0.57	0.193
6. Learning objectives clarification	3.00±1.46	3.96±0.72	3.95±1.10	4.14±0.65	<b>0.007</b>
7. Time sufficiency	4.03±0.94	4.23±0.82	4.05±0.60	4.06±0.87	0.746
8. Create appropriate environment for discussion	3.45±1.53	3.85±0.83	3.85±0.81	3.97±0.75	0.796
9. Solving the problem with previous knowledge	2.34±1.11	3.12±1.07	2.79±1.03	2.91±1.25	0.078
10. Sufficient references found	2.38±1.37	2.81±1.33	3.65±0.67	3.91±0.95	<b>&lt;0.001</b>
General evaluation	6.21±2.39	7.41±1.67	7.75±1.16	8.03±0.95	<b>0.008</b>

Values are given as mean ± standard deviation. The first 10 items were evaluated over 5 points and the last item (general evaluation) was evaluated over 10 points. The students' feedback rates for scenarios were as follows:

1<sup>st</sup> scenario: 29/78 (37%)

2<sup>nd</sup> scenario: 26/78 (33%)

3<sup>rd</sup> scenario: 19/78 (24%)

4<sup>th</sup> scenario: 4/78 (5%)

defective areas. The first scenario was evaluated as defective in terms of learning what to know ( $p=0.007$ ) This difference was caused by the difference between the 1<sup>st</sup> and the 4<sup>th</sup> scenario. Reaching sufficient resources of knowledge ( $p<0.0001$ ) The differences between 1-3 ;1-4 and 2-4 scenarios were responsible for this result. General evaluation ( $p=0.008$ ) differs because of the difference between 1-4 groups (Table 2).

The students provided feedback only for the ethics and genetics presentations. We processed these feedbacks with Mann Whitney U analysis. As a post hoc test Dunn was used. Ethics presentation was significantly superior in terms of clear definition of the objectives ( $p=0.008$ ), interactivity management ( $p<0.0001$ ), and understanding what to know ( $p=0.03$ ) (Table 3).

There were ten problem based groups and eight clinical skills groups. After all PBL scenarios, feedback meetings were designed with the facilitators led by the chairman of the block. These meetings, provided a chance to know if the learning objectives were achieved by the students, enabling us to reevaluate the learning objectives and possibly include the item in the next scenario.

The reproducibility can be supplied by the following route:

1. Determining the learning objectives with the team
2. Organizing lectures, PBL sessions, and clinical laboratory sessions
3. Implementation
4. Evaluation

## DISCUSSION

In this study we aimed to give preclinical aspects of geriatrics to undergraduate students. Of the students 97% were successful and achieved at least 70% of the learning objectives (the examination cut off was 70/100). We believe that the learning objectives were achieved.

In a study comparing the undergraduate geriatric curriculum in Japan with that of other countries, geriatric undergraduate education in Japan was found to emphasize the theoretical aspects of aging in general. Similar to Turkey, only a few Japanese medical schools have a professorial geriatrics department. In our study we also had a curriculum emphasizing the theoretical aspects.

In a report of the European Summit on Age related Diseases, Cruz Jeutoft et al. recommend screening the nutritional status and physical activity, mental stimulation and mental compensation strategies, public and governmental appreciation, vaccine recommendations, and emphasizes further development of geriatric medicine and multidimensional comprehensive geriatric assessment, and developing old age psychiatry, which we also emphasize in our curriculum (10).

When we compare the educational processes within schools which received Donald W Reynolds Foundation Education Grants, our curriculum has similarities with Cornell University, University of Hawaii, University of Rochester, and the Medical College of Wisconsin in that they all have new lectures, PBL exercises, and standardized patients (11). Duque et al. from Canada, compared two edu-

**Table 3—** Student's Feedback to Ppt Presentations

	Genetics	Ethics	p
An impressive introduction was made	4.25±1.06	4.71±0.47	0.299
Aims and objectives were defined clearly	3.92±0.90	4.79±0.43	0.008
The time period for the session was enough	4.33±1.15	4.71±0.47	0.422
Audio-visual equipment was used properly	4.42±0.79	4.79±0.43	0.204
The presenter obeyed the time restriction	4.50±0.67	4.86±0.36	0.111
The content was satisfactory scientifically	3.82±1.40	4.71±0.47	0.081
The interaction provided with different questions	2.75±1.22	4.71±0.47	<0.0001
I listened all the content with any attention deficit	3.42±1.51	4.14±0.77	0.248
The content satisfied my expectations	3.08±1.56	4.50±0.65	0.018
A good summary was done	3.92±0.90	4.50±0.63	0.086
The session helped me to understand what to know	3.50±1.09	4.36±1.30	0.033
I want to learn more on this subject	3.75±1.29	4.00±1.30	0.516
General	7.50±2.5	8.86±0.95	0.269

Values are given as mean±st deviation

The student feedback rates for presentations were as follows:

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the others: none

cational programs for the second preclinical year; one course included weekly sessions, while two courses included integration of weekly courses into one integrated week. They found that the integrated week was a more effective learning tool (12). This may be interpreted as - "compact courses may produce better results". We used intense courses of four weeks and this may be an appropriate method to introduce geriatrics to students.

When compared with the European Academy of Yuste foundation, our curriculum emphasizes the theoretical aspects more intensely, whereas the latter has more components for the clinical aspects. In this regard British Geriatrics Society's (BGS) curriculum is similar to European Academy of Yuste foundation's curriculum. Although BGS had 35 learning objectives versus our 71, BGS's curriculum had more clinical objectives than ours.

We ordered post-block examination questions from the block committee members in proportion to the learning objectives. The final exam was composed of these multiple choice questions. When we examined the questions after the examination, we realized that 42.5% of the questions were medium and high quality.

According to the oral feedback taken from students and tutors, the second and third scenarios covered fewer learning objectives while with the other two scenarios all learning objectives were achieved. As both the tutor and the student feedbacks suggested the same conclusion, the first scenario should be changed next year. In the post-block report we

emphasized this fact and suggested a practical distribution of the learning objectives among the scenarios and presentations.

For defining learning objectives we organized numerous meetings. Due to the difficulty of bringing the 15 participants together, we organized many one on one meetings. We suggest using an electronic platform to communicate in a structured way by defining the product and the pathway to do it, so the curricula may be created with less effort.

More feedback is required to evaluate the results properly, thus, we decided to motivate the students to give feed back.

As the program committee suggested this curriculum to be unique, we compared the final product of learning objectives with the other curricula (including the British Geriatric Society's medical undergraduate curriculum). Michel et al. stated that of the 31 surveyed countries, 25 have undergraduate teaching in geriatrics. Only two have contents based on European Union core curriculum recommendations, and in most countries, each medical school determines the undergraduate curriculum independently (13).

We should have performed a pre- and post-test to evaluate the program more accurately. In addition, an external scrutiny of the curriculum should be carried out in order to prevent bias as O'Neill and Holland suggested in their "lessons for curriculum development" for the 40 schools in the context of John A Hartford foundation's curricular innovation program, each of which were supported by 100.000 USD (14).



For the program evaluation, four assessment levels were defined by Kirk Patrick. The first level of evaluation is addressing the reactions and the satisfaction levels regarding the educational program. The second level determines if the students have sufficient increase in knowledge. The third level indicates if the targeted behavioral changes occurred in the student's graduate professional life. The fourth level includes the long term results of the educational program such as reducing the cost and work loss, and improvement in health parameters. In the current study, we cannot draw any conclusions for the graduate students and the future projections yet.

The weak aspects of this study include university's having no geriatrics department and no geriatricians and the lack of budget. As the return on educational investment in geriatrics training is not as good as that in general internist training in terms of net income per hours worked (although this cannot be an accurate measure), efforts in this arena – such as that in the Boston University's Center of Excellence which offered a unique faculty development program to create geriatrics oriented faculty in multiple disciplines (15,16) - will continue to increase. Thereby, the system may be able to better support geriatric studies.

The European core curriculum requires a professor or head of geriatrics department in the teaching team. Excluding this requirement, our curriculum supplies the nonclinical part of the criteria of “core competencies” and “knowledge” of the European core curriculum (17).

In conclusion we want to emphasize that faculties without a geriatrics department are capable of designing and implementing their own curriculum according to their needs and their resources.

We are aware that we have found only a functional link in between “no formal education” and “a structured geriatrics undergraduate education lead by geriatrics clinics”. The full impact of these programs will not be known until the trainees start practice and their educational careers.

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### Phase III Geriatrics Block Learning Objectives

The student should be able to,

#### GENETICS

- define the term "elderly" and explain the theories of aging.
- explain how the cellular changes take place and describe the effects of these changes.
  - explain the changes free radicals cause.
  - describe the consequences of the changes in chromosome telomers.
  - explain the effects of mitochondrial mutations on aging.
  - explain the effects of DNA mutations on aging.
  - explain the effects of lysosomal changes on cellular aging.
- state the effects of genes on aging of somatic cells and explain the mechanisms.
- explain the changes in the immune system due to aging.
  - describe the changes in T cell development and function with aging and the consequences.
  - explain the changes in humoral immune response and the consequences.
  - explain the changes in IgG and IgA levels and the consequences.
  - describe the changes that occur in CD5+ and CD5- cells which are B lymphocytes.
  - explain the changes in macrophage functions in the elderly and the consequences.
  - state the reasons for the changes in antibody formation.
- explain the changes in the natural immune response due to aging and the consequences.

#### DERMATOLOGY

- explain how skin ages.
- explain the changes in skin due to aging and the consequences.

#### EYE DISEASES

- state the changes in the eye due to aging.
  - define presbyopia and explain the mechanism.
  - define senile cataract and explain the mechanism.
  - define dry eye and explain the mechanism.
  - define age related macular degeneration and explain the mechanism.

#### NEPHROLOGY

- explain the changes in kidney due to aging and the consequences.
  - explain the changes in glomerular structure and function.
  - explain the changes in kidney mass and the functional nephrons and the consequences.
  - explain the changes in mesangial matrix and the mesangial cells and the consequences.
  - explain the changes in tubular length and mass and the consequences.
  - explain the changes in tubulointerstitial fibrous tissue.
  - explain the changes in tubular and glomerular basement membrane.
- explain the changes in glomerular filtration with aging and the consequences.
- describe fluid and electrolyte changes in the elderly and the consequences.
  - explain why older people have increased tendency to dehydration.
  - explain why thirst threshold is increased.
  - explain the change in ADH release with aging.
  - explain the change in renal response to sodium load.

- explain the change in bodily response to potassium excess and deficiency with aging.
  - explain how hyponatremia and hyporeninemic hypoaldosteronism takes place in the elderly.
- explain the changes in the renin angiotensin system and the consequences.
    - explain the changes in AVP release due to aging and the consequences.
  - explain the effects of aging on acid-base equilibrium and the consequences.

#### RESPIRATORY SYSTEM

- describe the effects of aging on respiration.
  - explain the changes in airways.
  - explain the changes in lung parenchyma.
  - explain the changes in respiratory mechanics.
  - explain the changes in respiratory control.

#### CARDIOVASCULAR SYSTEM

- explain the changes that lead to cardiovascular function defects due to aging.
  - explain the changes in the myocardium with aging.
  - describe the changes in the conduction system.
  - explain the degenerative changes in fibrous skeleton of the heart.
  - explain the structural differences in bigger vessels.
  - explain the effects of myocardial change on cardiac function.
- explain the increase in the incidence of cardiovascular diseases with aging

#### UROGENITAL SYSTEM

- explain the changes in the female urogenital system.
  - explain the changes in the ovary with aging and the consequences.
  - explain the changes in the vulva and the vagina with aging and the consequences.
  - explain the changes in the uterus with aging and the consequences.
  - explain the changes in the urethra and the bladder with aging and the consequences.
- explain the changes in the female sexual life.
  - define dyspareunia and explain the reasons.
  - explain the changes in the nature of sexual life.
- explain the vasomotor changes and etiology in menopause.
  - explain the etiology of night sweats and flushing.
- explain the changes in urination function with aging and the consequences.
  - explain the changes in the urinary bladder and its innervation and the consequences.
  - explain the changes in the prostate gland with aging and the consequences.
  - explain how metabolic and endocrine problems due to aging affect urination.
- explain the changes in the sexual function and the reproductive system with aging.
  - explain how late onset hypogonadism develops.
  - explain the physiology of and changes in erectile function.
  - explain the brainy control of sexual function.
  - explain the effects of aging on ejaculatory function.

#### DIET

- explain the dietary needs in aging.
  - explain the changes in food and energy need and its reasons.
  - explain food production, cooking and storage instructions for elderly.



### NEUROLOGY

23. explain the concept of "healthy aging".
24. explain the risk factors for cognitive aging.
  - a) explain the concept of neuroplasticity.
  - b) explain the concept of "neuroplasticity deficiency"
  - c) explain which cognitive functions deteriorate in aging.
25. explain the cellular changes occurring in the brain with aging and the consequences.
  - a) explain where the aging starts in brain.
  - b) explain the brain lesions due to aging (amyloid plaques, lewy bodies etc.)
  - c) explain which parts of brain go to atrophy and its reasons.
26. explain the "age related forgetfulness"
27. explain the concept of "minimal cognitive impairment"

### PSYCHIATRY

28. explain the characteristics of ego integrity vs despair term
29. explain the social changes in aging.
30. explain the characteristics of sexual behaviour in aging.
31. explain the steps of facing death.

### EAR NOSE THROAT

32. explain the changes in hearing and equilibrium.
  - a) define tinnitus and vestibular dysfunction.

### ENDOCRINOLOGY

33. explain the changes in thyroid functions with aging.
  - a) explain the changes in TRH synthesis in aging.
  - b) explain the changes in TSH level with aging.
  - c) explain the TSH pulse amplitude quality with aging.
  - d) explain the changes in serum T4 levels with aging.
  - e) explain the changes in serum T3 levels with aging.
  - f) explain the changes in thyroid autoantibody levels in aging.
34. explain the reasons and the consequences of insulin resistance in aging.
35. explain the changes in IGF in aging.
36. explain the changes in hypothalamo-hypophysial-adrenal axis in aging.
37. explain the changes in DHEA with aging and the consequences.
38. explain the change in melatonin levels in aging.
39. explain the changes in sympathetic autonomic nervous system with aging.
40. explain the changes in growth hormone in aging.
  - a) explain the characteristics of growth hormone 'pulse' amplitude.
  - b) explain the response of GH to GHRH.
  - c) explain the changes in GH releasing receptors.
  - d) explain the changes in GH levels.
  - e) explain the changes in IGF-1 levels.

### GASTROENTEROLOGY

41. explain the differences in food intake, absorption and digestion with aging.
  - a) explain functional and structural changes in esophagus, stomach and the intestine.
42. explain the effects of aging on structure and function of the liver and pancreas.

### MUSCULOSKELETAL SYSTEM

43. explain the effects on muscle and skeleton physiology.
  - a) explain the reasons for loss of bone mass with aging.
  - b) explain the reasons and the consequences of changes in cartilage with aging.
  - c) explain the reasons and the consequences of changes in joints with aging.

- d) explain the reasons and the consequences of changes in muscles with aging.
44. explain the reasons and consequences of osteoporosis development.
45. explain the calcium-PTH-vitamin D relationship through intestine-kidney and bone.
  - a) explain the effects of PTH on bone.
  - b) explain the effects of PTH on intestine.
  - c) explain the effects of PTH on kidney tubules.
  - d) explain the use of PTH.
46. explain the fractions of calcium in plasma.
47. explain the role of calcium treatment in postmenopausal osteoporosis.
48. explain the calcium preparations used PO and parenteral.
49. explain the hormones and drugs that affect Ca metabolism and their effects on bone.
50. explain the vitamin D metabolism.
  - a) explain the subtypes of vitamin D.
  - b) explain the transformation of cholecalciferol to active vitamin D.
  - c) explain the vitamin D bioactivation.
  - d) explain the effects of vitamin D on calcium and phosphate absorption from intestine.
  - e) explain the effects of vitamin D on bone.
  - f) explain the effects of vitamin D on kidneys.
  - g) explain the noncalcitropic effects of vitamin D.
  - h) explain the vitamin D deficiency.
  - i) explain the use of vitamin D
  - j) explain the adverse effects of vitamin D.
51. explain the vitamin D resources.
52. explain the daily need of vitamin D in aging.
  - a) explain the pharmacological forms of vitamin D
53. explain where calcitonin synthesis takes place, its physiological and pharmacological effects and its use .

### PHARMACOLOGY

54. define HRT (hormone replacement treatment) and explain the results.
55. explain the pharmacokinetic properties of the drugs in the elderly.
56. explain the biotransformation of the drugs and the consequences.
57. explain the distribution, transportation and excretion of drugs.
58. explain the drug-drug interactions and the mechanisms of these interactions.
59. explain the factors that change the effects of drugs.

### PUBLIC HEALTH

60. explain how chronic diseases affect the health of the individual.
61. explain how chronic diseases affect public health .
62. define primary, secondary and tertiary prevention for chronic diseases.
63. explain the principles of a diet for preventing chronic diseases.
64. explain the delay in early detection of diseases.
65. explain the reasons for difficulty in diagnosis of diseases in the elderly.
66. perform interviews and physical examinations in the elderly.
67. explain the health services for the elderly in our country.
68. define the adult vaccination procedures and the risk groups.

### ETHICS

69. define elderly abuse.
70. define age discrimination.
71. explain the ethical problems in geriatric care.

### ACKNOWLEDGEMENT II

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