Dahiliye Hastasının İlaç Torbası: Gerekli ve Gereksiz Kullanılan İlaçlar, İlaç Etkileşimleri

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Akılcı İlaç Kullanımı nedir?

- Akılcı İlaç Kullanımı, DSÖ'nün 1985 yılında Nairobi'de tanımlamış olduğu şekliyle:
- "Kişilerin klinik bulgularına ve bireysel özelliklerine göre uygun ilacı, uygun süre ve dozajda, en uygun maliyetle ve kolayca sağlayabilmeleridir."
- Bir endikasyon için uygun ilaç, etkililik, güvenlilik ve maliyet kriterleri dikkate alınmışsa, akılcı olarak seçilebilir.

T.C. Sağlık Bakanlığı Türkiye İlaç ve Tıbbi Cihaz Kurumu web sayfası: http://www.akilciilac.gov.tr/?page_id=599

Akılcı İlaç Kullanımı neden gereklidir?

- Akılcı İlaç Kullanımı, öncelikli olarak halkın sağlığını ve toplumun çıkarını gözetir.
- Tüm dünyada yanlış şekilde, gereksiz yere, etkisiz ve yüksek maliyetli ilaç kullanımı gibi nedenlerle ilişkili olarak çok çeşitli sorunlar yaşanmaktadır. Tespit edilen bu sorunlar arasında:

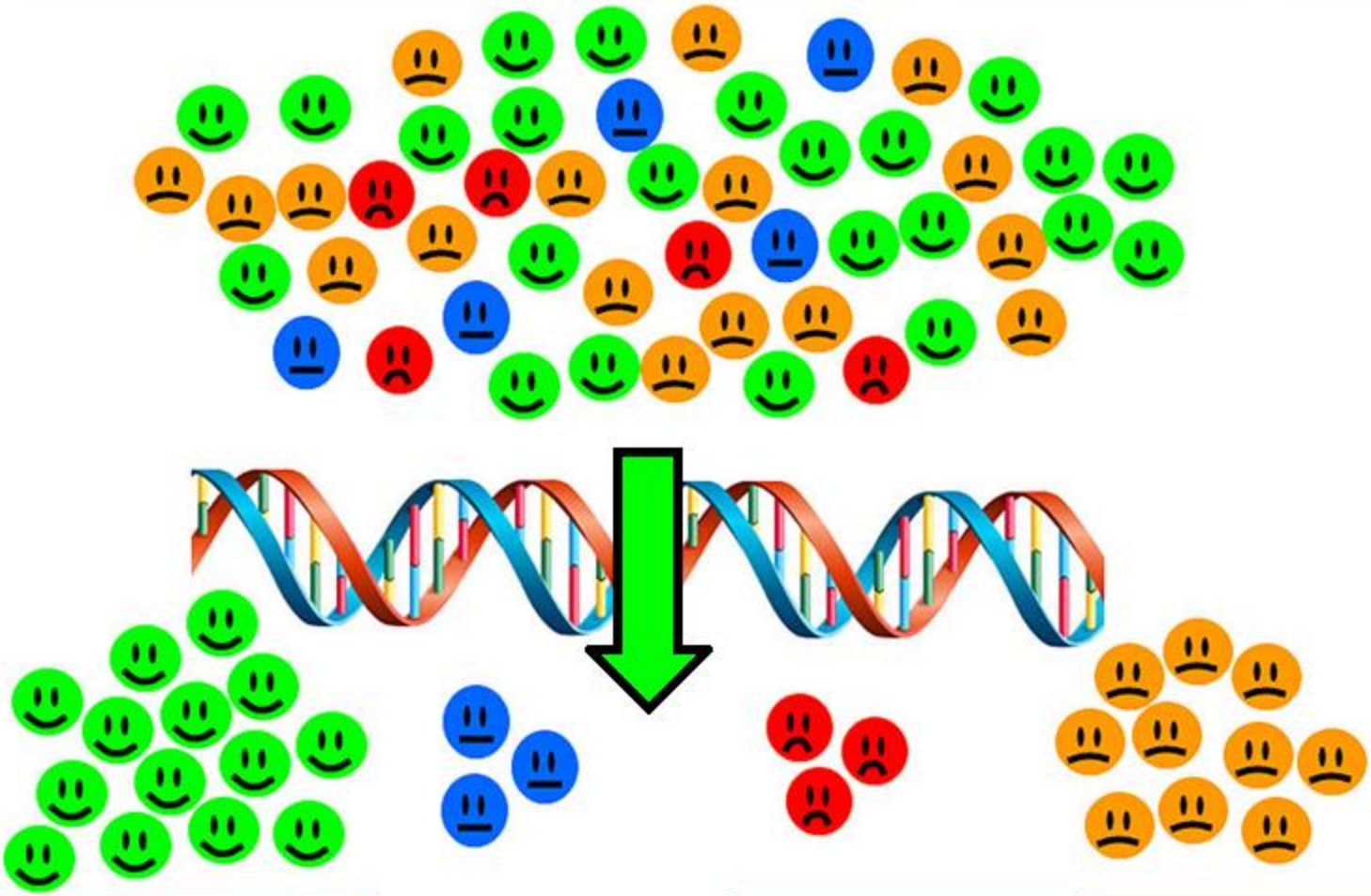
Akılcı İlaç Kullanımı neden gereklidir?

- Temel ilaç listelerine veya güncel rehberlere uygun olmayan ilaçların reçetelere yazılması;
- Özel hasta gruplarına uygunsuz ilaç yazılması/kullanılması;
- Gereksiz yere pahalı ilaçların yazılması/kullanılması,
- Gereksiz yere antibiyotik yazılması/kullanılması,
- Gereksiz yere enjeksiyon preparatı yazılması/kullanılması;

Akılcı İlaç Kullanımı neden gereklidir?

- Hekimlerin tedavileri konusunda hastalarına yeterli bilgileri vermemesi;
- Yazılan reçetelerin gereken tüm doğru bilgileri içermesine özen gösterilmemesi;
- Eczacıların reçete karşılama, ilaç verme ve hastayı bilgilendirme konusunda yeterli davranış sergilemesi;
- Sağlık personelinin ilaç uygulama hatası yapması;
- Yanlış ilaç kullanımını kolaylaştıran ilaç üretimi ve dağıtımı kaynaklı çeşitli altyapı sorunlarının bulunması.

Aynı hastalık tanısı, standart ilaç tedavisi

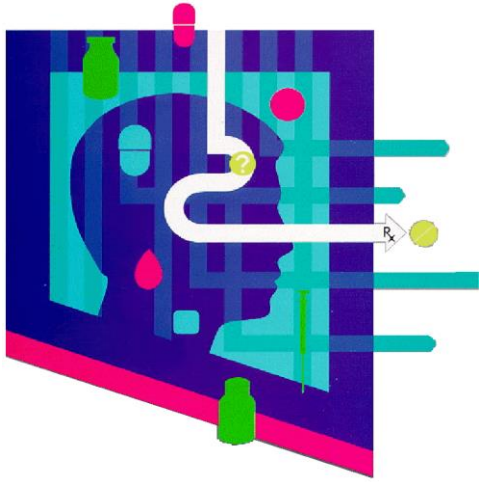


ADVERS ETKİLER

- ABD'de 4. sıklıkta ölüm nedenidir.
- Tahmin edilen, ilaçlara bağlı morbidite ve mortalite giderleri ABD'de 130 milyar USD.
- Advers etkiler ABD ve Avustralya'da hastaneye yatışların % 4-6'sından sorumludur.
- En sıklıkla ve en masraflı advers olaylar; kanama, aritmi, hipotansiyon, ateş, diyare, kaşıntı, kusma, böbrek yetmezliği olarak bildirilmiştir.

White et al, Pharmacoeconomics, 1999, 15(5):445-458

AKILCI İLAÇ KULLANIMI



- **Kişilerin klinik bulgularına ve bireysel özelliklerine göre;**
  - ➔ **uygun ilacı**
  - ➔ **uygun süre ve dozda**
  - ➔ **en uygun maliyetle** ve
  - ➔ **kolayca sağlayabilme**leri olarak tanımlanmaktadır[1].

1. *Conference of Experts on the Rational Use of Drugs*, World Health Organization, Nairobi, Kenya, WHO/CONRAD/WP/RI, (25-29.12.1985).

Tanım

- Polifarmasi
- Değişik tanımlamalar
  - ≥4-5 ilaç kullanımı [1,2]
  - Klinik endikasyondan fazla ilaç kullanımı[3]
  - En az bir gereksiz ilaç kullanımı[3]

1. Ferner RE, et al. BMJ 2006;333: 143-145.
2. Medicines and older people: implementing medicines-related aspects of the NSF for older people.

http://www.gov.uk/nsf/olderpeople/htm.

3. Wyles H, Rehman HU. Eur J Intern Med 2005;16: 311-3.

- ≥ 4-5 ilaç kullanımı her zaman uygunsuz değil
- İlaç sayısının fazlalığı yan etki için bağımsız risk faktörü

Steinman MA, Hanlon JT. JAMA 2010;304: 1592-601.
Field TS, et al. Arch Intern Med 2001;161: 1629-1634.

Epidemiyoloji

- ABD'de
  - >65 yaş %13 ancak toplam reçetelerin 1/3'ü bu gruba ait
  - >65 yaş, >5 ilaç kullanımı: %23
  - 75-85 yaş arası, >5 ilaç kullanımı %35-40
- İngiltere
  - >60 yaş %20 ancak reçetelerin >%50 bu gruba ait
- Türkiye
  - Geriatri poliklinik başvuruları
    - İTF'de ortalama 4.6
    - HÜTF'de başvuruda 3.7 , görüşme sonrası 6.1

- Hastaneden çıkarılan kırılgan yaşlıların %44'ünde en az 1 gereksiz ilaç kullanımı
- Bakımevinde %40 en az 1 gereksiz ilaç kullanımı

Etyoloji

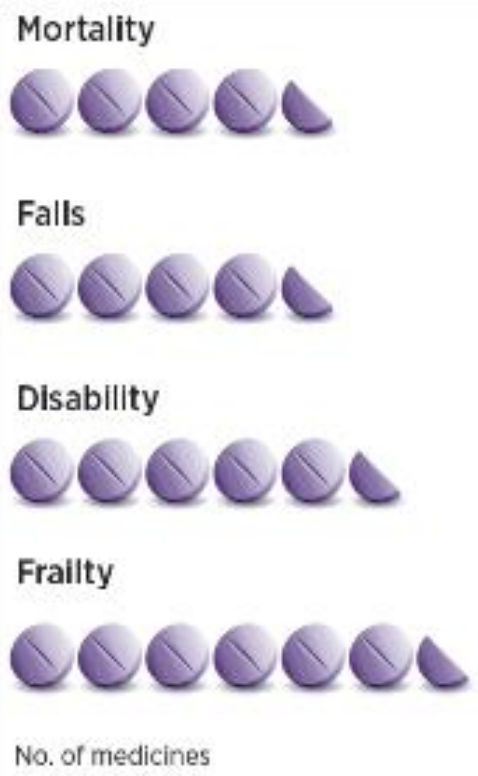
- Çok sayıda komorbidite
- Değişik hekimlere başvuru
- Reçeteleme kaskadı
- Hasta ve Bakım veren ile ilişkili faktörler
  - İleri yaş
  - Kognisyon problemi
  - Görme bozukluğu-diğer fonksiyonel bozukluklar
  - Bakımevinde yaşama
  - Hastalık ve ilaçlar hakkında bilgi eksikliği
- Hekimlerin ilaç yan etki ve etkileşimleri konusundaki bilgisizlikleri

Reçeteleme Kaskadı

- İlaç yan etkisi olan bir semptomun, yan etki olduğunun farkedilmemesi, yeni bir hastalık semptomu olduğu varsayımı ile yeni ilaç eklenmesi
- Örnek
  - Metoklopramid'e bağlı parkinsonizm
    - Parkinson tedavisi (dopaminerjik ajan)
  - ChEi'ye bağlı üriner inkontinans
    - İnkontinans tedavisi (mesane antikolinerjiği)

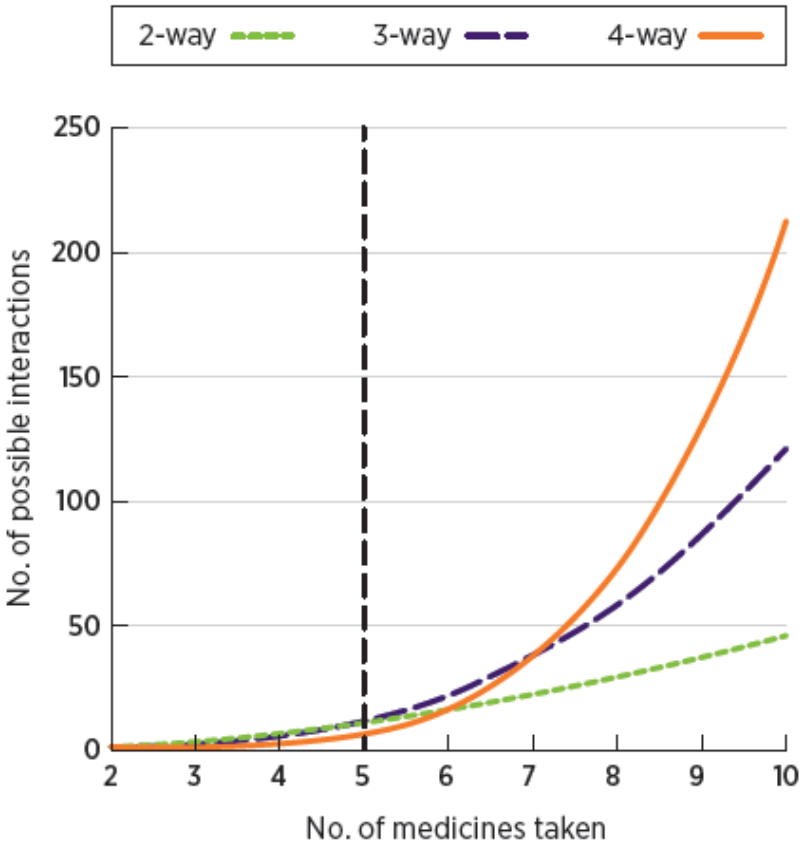
Polifarmasi ile ilişkili sorunlar

- Artmış advers ilaç reaksiyonları
- İlaç etkileşmeleri
- İlaç karmaşası
- Sakatlık/maluliyet
- Zafiyet/zayıflık/güçsüzlük
- Azalmış yaşam kalitesi
- Artmış morbidite
- Artmış mortalite



İlaç etkileşme olasılığı

- Hastanede yatan ve polifarmasisi olan (beşten fazla ilaç alan) yaşlı hastalarda yapılan bir çalışmada potansiyel sitokrom P450 ilaç etkileşmeleri araştırıldığında % 80'inde potansiyel etkileşme saptanmıştır.
- Beş ilaç kullanan hastaların % 50'sinde en az bir etkileşme tespit edilmiş ve tedaviye eklenen her bir ilaç ile etkileşme olasılığının % 12 civarında arttığı sonucuna ulaşılmıştır.



Ferner RE, Aronson JK. Communicating information about drug safety. BMJ 2006;333:143–5.

Bir Hastanın İlaç Torbası

- Kullandığı ilaçlar:
  1. Lustral 50 mg tablet (sertralin): Her sabah bir tane
  2. Diamicron 80 mg tablet (gliklazid): Her sabah bir tane
  3. Glukophage 500 mg (metformin): Günde üç defa
  4. Lansor 20 mg kapsül (lansoprazol): Her sabah bir tane
  5. Coraspin 100 mg (aspirin): Her sabah bir tane
  6. Fosamax 10 mg (alendronat): Her sabah bir tane
  7. Monolong SR 50 mg (izosorbid dinitrat): Her sabah bir tane
  8. Tranko Buskas 10+10 mg tablet (**hiyosin**+medazepam): Günde üç defa
  9. Naprosyn 500 mg suppozituvar (naproksen): Gece yatarken bir tane
  10. Purinol 500 mg granül (heksamin hippurat): Günde üç defa
  11. Pursennid 12 mg draje (senna glikozidleri): Gece yatarken bir tane
  12. Ural: 11 adet bitkiden oluşan ayurvedik bitkisel ürün: Gece bir tane

İlaç Etkileşimi (Analiz)

Bu ilaçlar arasında 14 adet potansiyel etkileşme (12 C, 2 D kategori) mevcuttur.

Alendronate
- [C] Aspirin (Aspirin)
- [C] Lansoprazole (Proton Pump Inhibitors)
- [C] Naproxen (Nonsteroidal Anti-Inflammatory Agents)

Aspirin
- [C] Alendronate (Alendronate)
- [C] Gliclazide (Blood Glucose Lowering Agents)
- [C] MetFORMIN (Blood Glucose Lowering Agents)
- [D] Naproxen (NSAID (Nonselective))
- [C] Sertraline (Selective Serotonin Reuptake Inhibitors)

Gliclazide
- [C] Aspirin (Salicylates)
- [C] MetFORMIN (Antidiabetic Agents)
- [C] Sertraline (Selective Serotonin Reuptake Inhibitors)

Hexaminolevulinate
- No interactions identified with others in the selection list.

Hyoscine (Systemic) (SYN) (Scopolamine (Systemic))
- [C] Oxazepam (CNS Depressants)
- [C] Sertraline (Selective Serotonin Reuptake Inhibitors)

Isosorbide Mononitrate
- No interactions identified with others in the selection list.

Lansoprazole
- [C] Alendronate (Bisphosphonate Derivatives)

MetFORMIN
- [C] Aspirin (Salicylates)
- [C] Gliclazide (Hypoglycemia-Associated Agents)
- [C] Sertraline (Selective Serotonin Reuptake Inhibitors)

Naproxen
- [C] Alendronate (Bisphosphonate Derivatives)
- [D] Aspirin (Salicylates)
- [D] Sertraline (Selective Serotonin Reuptake Inhibitors)

Oxazepam
- [C] Hyoscine (Systemic) (SYN) (CNS Depressants)
- [C] Sertraline (Selective Serotonin Reuptake Inhibitors)

Senna
- No interactions identified.

Sertraline
- [C] Aspirin (Aspirin)
- [C] Gliclazide (Blood Glucose Lowering Agents)
- [C] Hyoscine (Systemic) (SYN) (CNS Depressants)
- [C] MetFORMIN (Blood Glucose Lowering Agents)
- [D] Naproxen (NSAID (Nonselective))
- [C] Oxazepam (CNS Depressants)

Lexi-Comp UptoDate database

Olgu

H.S.

72 y, erkek

Yunanistan doğumlu

Emekli öğretmen

Darülaceze sakini

Şikayet

Halsizlik, uyku hali, baş dönmesi

Hikaye

- Hipertansiyon
- Tip 2 Diyabet
- Diabetik nöropati
- Periferik arter hastalığı
- İdrar inkontinans
- Kronik venöz yetersizlik
- Depresyon
  - Çok ilaç içtiğinden (17 değişik ilaç, 24 doz) yakınıyor ve ilaç içmeyi reddediyor

Kullandığı İlaçlar

Glifor1000 mg ® (metformin) 2x1

Glucobay 100® (akarboz) 3x1

Amarly 2 mg (glimeperid) 1x1

Gabateva®(gabapentin)3x 500 mg

Thioctacide tb ® (alfalipoik asit) 1x1

Eslopram20 mg ® (citalopram) 1x1

Diazem 2mg ® (Diazepam) lh

Laroxyl 10®(Maprotilin Hidroklorür) 1x1

Dispril 300 mg tb ® (asetilsalisilik asit) 1x1

Lansoprol 30® (lansoprozol) 1x1

Enapril10 mg ® (enalapril maleat) 1x1

Vasoxen 5 mg tb® (nebivolol) 1x1

Xatral 10 mg®(Alfuzosin hidroklorür) 1x1

Vesicare 5 mg (solifenacin) 1x1

Doxium 500mg ® (Dobesilat kalsiyum) 2x1

Trental 600 ® (pentoksifilin) 2x1

Desal 40 mg ® (furosemid)1x1

Laboratuvar

- Kreatin: 1.01 mg/dl
- LDL: 81 mg/dl
- HbA1c: %9.3
- TSH: 1.04 U/L
- Vitamin B12: 738 pg/ml
- PSA: 1.78 ng/ml

Kullandığı İlaçlar

Glifor1000 mg ® (metformin) 2x1

Glucobay 100® (akarboz) 3x1

Amarly 2 mg (glimeperid) 1x1

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Trental 600 ® (pentoksifilin) 2x1

Desal 40 mg ® (furosemid)1x1

Kullandığı İlaçlar

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Amarly 2 mg (glimeperid) 1x1

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Vesicare 5 mg (solifenacin) 1x1

Doxium 500mg ® (Dobesilat kalsiyum) 2x1

Trental 600 ® (pentoksifilin) 2x1

Desal 40 mg ® (furosemid)1x1

- Glifor 1000 mg ® (metformin) 2x1
  - DM tedavisinde altın standart
  - GFR>45 ml/dk olduğundan devam edilmesinde bir sakınca yoktur

NEDEN

Yararlı ilaçları kullan

Kullandığı İlaçlar

Glifor1000 mg ® (metformin) 2x1

Glucobay 100® (akarboz) 3x1

Amarly 2 mg (glimeperid) 1x1

Gabateva®(gabapentin)3x 500 mg

Thioctacide tb ® (alfalipoik asit) 1x1

Eslopram20 mg ® (citalopram) 1x1

Diazem 2mg ® (Diazepam) lh

Laroxyl 10®(Amitriptilin Hidroklorür) 1x1

Dispril 300 mg tb ® (asetilsalisilik asit) 1x1

Lansoprol 30® (lansoprozol) 1x1

Enapril10 mg ® (enalapril maleat) 1x1

Vasoxen 5 mg tb® (nebivolol) 1x1

Xatral 10 mg®(Alfuzosin hidroklorür) 1x1

Vesicare 5 mg (solifenacin) 1x1

Doxium 500mg ® (Dobesilat kalsiyum) 2x1

Trental 600 ® (pentoksifilin) 2x1

Desal 40 mg ® (furosemid)1x1

- Glucobay 100® (akarboz) 3x1
  - HbA1c üzerindeki etkisi %0,5-1 arasında
  - GİS intoleransına yol açabilir
  - Doz sıklığı fazla (günde 3 doz)

Kesilebilir!!!

Kullandığı İlaçlar

Glifor1000 mg ® (metformin) 2x1

Glucobay 100® (akarboz) 3x1

Amarly 2 mg (glimeperid) 1x1

Gabateva®(gabapentin)3x 500 mg

Thioctacide tb ® (alfalipoik asit) 1x1

Eslopram20 mg ® (citalopram) 1x1

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Vesicare 5 mg (solifenacin) 1x1

Doxium 500mg ® (Dobesilat kalsiyum) 2x1

Trental 600 ® (pentoksifilin) 2x1

Desal 40 mg ® (furosemid)1x1

Tip 2 Diyabet

GLİSEMİK HEDEFLER

Glisemi Parametresi	ADA[1]	TEMD[2]
HbA1C %	7.0	6.5
FPG mg/dl	70-130	70-120
PPG mg/dl	<180	<140

[1]Diabetes Care January 2016vol. 36 no. Supplement 1 S11-S61 [2]TEMD Kılavuzu 2015

3. ANTİHİPERGLİSEMİK TEDAVİ

- **Glisemik Hedefler**
  - **HbA1c < 7.0%** (ortalama PG ~150-160 mg/dl
  - Pre-prandiyal PG <130 mg/dl
  - Post-prandiyal PG <180 mg/dl
  - **Kişiselleştirmek şarttır**:
    - Daha sıkı hedefler (6.0 - 6.5%) – daha genç, daha sağlıklı kişilerde
    - Daha gevşek hedefler (7.5 - 8.0%+) – daha yaşlı, komorbiditesi olan, hipoglisemiye yatkın vs. kişilerde
  - Hipoglisemiden kaçınılması

Diabetes Care, Diabetologia. 2012

TİP 2 DİABETTE İNSÜLİN TEDAVİ ENDİKASYONU

I. RELATİF İNSULİN EKSİKLİĞİ (C Peptid var)

(Kısa/Uzun Süreli İnsülin Kullanımı)

a. İnsülin Sekresyon Azalması

Sekonder Yanıtsızlık (Max doz SU ve/veya MET/GLİT ile HbA1C: % 8 üstü olması)

b. İnsülin İhtiyacının Artması

Enfeksiyon

Akut Hastalık (Mİ,SVA,Pleji vb)

Cerrahi Müdahale,Travma

Oral kortikostreoid başlanması

II. MUTLAK İNSÜLİN EKSİKLİĞİ (C Peptid Yok)

Kullandığı İlaçlar

Glifor1000 mg ® (metformin) 2x1

Glucobay 100® (akarboz) 3x1

Amarly 2 mg (glimeperid) 1x1

Gabateva®(gabapentin)3x 500 mg

Thioctacide tb ® (alfalipoik asit) 1x1

Eslopram20 mg ® (citalopram) 1x1

Diazem 2mg ® (Diazepam) lh

Laroxyl 10®(Amitriptilin Hidroklorür) 1x1

Dispril 300 mg tb ® (asetilsalisilik asit) 1x1

Lansoprol 30® (lansoprozol) 1x1

Enapril10 mg ® (enalapril maleat) 1x1

Vasoxen 5 mg tb® (nebivolol) 1x1

Xatral 10 mg®(Alfuzosin hidroklorür) 1x1

Vesicare 5 mg (solifenacin) 1x1

Doxium 500mg ® (Dobesilat kalsiyum) 2x1

Trental 600 ® (pentoksifilin) 2x1

Desal 40 mg ® (furosemid)1x1

- Gabateva (gabapentin) 3x500 mg
  - Diabetik nöropatisi için verilmiş
  - Çok ilaç kullanmak istemeyen hastamızın mevcut depresyon tedavisi modifiye edilirken eklenecek olan SNRI ile bu şikayeti kontrol altına alınabilir

Kesilebilir!!!

NEDEN

Aynı anda 2 veya 3 rahatsızlığı tedavi edebilen ilaçlar kullanmaya çalış

Kullandığı İlaçlar

Glifor1000 mg ® (metformin) 2x1

Glucobay 100® (akarboz) 3x1

Amarly 2 mg (glimeperid) 1x1

Gabateva®(gabapentin)3x 500 mg

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Doxium 500mg ® (Dobesilat kalsiyum) 2x1

Trental 600 ® (pentoksifilin) 2x1

Desal 40 mg ® (furosemid)1x1

- Thioctacide tb ® (alfalipoik asit) 1x1
  - Erken dönemde tercih edilebilir, son dönem bir hastada verilmeyebilir

Kesilebilir!!!

Kullandığı İlaçlar

Glifor1000 mg ® (metformin) 2x1

Glucobay 100® (akarboz) 3x1

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Doxium 500mg ® (Dobesilat kalsiyum) 2x1

Trental 600 ® (pentoksifilin) 2x1

Desal 40 mg ® (furosemid)1x1

- Eslopram20 mg ® (citalopram) 1x1
  - Hastamız depresyon kliniği açısından değerlendirilmeli ve depresyonda olduğu veya idame antidepresan alması gerektiği düşünülürse;
    - Hastamızın SSRI tedavisi SNRI ile değiştirilebilir
    - Diabetik nöropati tedavisinde de kullanılabilir
    - Böylece gabapentin ve thioctacide ihtiyacı kalmayabilir ve kesilebilir

Kesilebilir!!!

NEDEN

Aynı anda 2 veya 3 rahatsızlığı tedavi edebilen ilaçlar kullanmaya çalış

Kullandığı İlaçlar

Glifor1000 mg ® (metformin) 2x1

Glucobay 100® (akarboz) 3x1

Amarly 2 mg (glimeperid) 1x1

Gabateva®(gabapentin)3x 500 mg

Thioctacide tb ® (alfalipoik asit) 1x1

Eslopram20 mg ® (citalopram) 1x1

Diazem 2mg ® (Diazepam) lh

Laroxyl 10®(Amitriptilin Hidroklorür) 1x1

Dispril 300 mg tb ® (asetilsalisilik asit) 1x1

Lansoprol 30® (lansoprozol) 1x1

Enapril10 mg ® (enalapril maleat) 1x1

Vasoxen 5 mg tb® (nebivolol) 1x1

Xatral 10 mg®(Alfuzosin hidroklorür) 1x1

Vesicare 5 mg (solifenacin) 1x1

Doxium 500mg ® (Dobesilat kalsiyum) 2x1

Trental 600 ® (pentoksifilin) 2x1

Desal 40 mg ® (furosemid)1x1

- Diazem 2mg ® (Diazepam) lh
  - Uzun etkili bir benzodiazepin grubu bir ilaç
  - Yaşlıda düşme riskini kolaylaştıracağı için tercih edilmez
    - Uykusuzluk nedeni ile almakta
      - Melatonin tercih edilebilir
      - Zopiklon (İmovan ®7.5 mg), Zolpidem(Ambien®, Stilnox®) 1x1 verilebilir
      - Mirtazapin 30 mg 1x/2 verilebilir, ancak iştahı artıracağından kötü regüle diyabeti olan bu hastada uygun bir tercih değil

Kesilmeli!!!

Kullandığı İlaçlar

Glifor1000 mg ® (metformin) 2x1

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Vesicare 5 mg (solifenacin) 1x1

Doxium 500mg ® (Dobesilat kalsiyum) 2x1

Trental 600 ® (pentoksifilin) 2x1

Desal 40 mg ® (furosemid)1x1

- Laroxyl 10®(Amitriptilin hidroklorür) 1x1
  - Uzun etkili bir trisiklik antidepresan
  - Yaşlıda ortostatik hipoT yapar ve düşme riskini artırır
  - Aritmi riski

Kesilmeli!!!

Kullandığı İlaçlar

Glifor1000 mg ® (metformin) 2x1

Glucobay 100® (akarboz) 3x1

Amarly 2 mg (glimeperid) 1x1

Gabateva®(gabapentin)3x 500 mg

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Xatral 10 mg®(Alfuzosin hidroklorür) 1x1

Vesicare 5 mg (solifenacin) 1x1

Doxium 500mg ® (Dobesilat kalsiyum) 2x1

Trental 600 ® (pentoksifilin) 2x1

Desal 40 mg ® (furosemid)1x1

- Dispril 300 mg tb ® (asetilsalisilik asit) 1x1
  - Periferik arter hastalığı, DM, HT
  - Doz azaltılmalı
  - ASA 80 mg yeterlidir

  - Nöroloji???
  - Kardiyoloji???

NEDEN

Yararlı ilaçları kullan

Kullandığı İlaçlar

Glifor1000 mg ® (metformin) 2x1

Glucobay 100® (akarboz) 3x1

Amarly 2 mg (glimeperid) 1x1

Gabateva®(gabapentin)3x 500 mg

Thioctacide tb ® (alfalipoik asit) 1x1

Eslopram20 mg ® (citalopram) 1x1

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Xatral 10 mg®(Alfuzosin hidroklorür) 1x1

Vesicare 5 mg (solifenacin) 1x1

Doxium 500mg ® (Dobesilat kalsiyum) 2x1

Trental 600 ® (pentoksifilin) 2x1

Desal 40 mg ® (furosemid)1x1

- Lansoprol 30® (lansoprozol) 1x1
  - ASA tedavisi alan hastanın bu tedavi alması uygundur ????
  - 60 yaş üzerinde ASA veya NSAİ kullanan olgulara primer profilaksi amaçlı PPİ verilmelidir (ACC; AHA; AGA)

NEDEN

Yararlı ilaçları kullan

Kullandığı İlaçlar

Glifor1000 mg ® (metformin) 2x1

Glucobay 100® (akarboz) 3x1

Amarly 2 mg (glimeperid) 1x1

Gabateva®(gabapentin)3x 500 mg

Thioctacide tb ® (alfalipoik asit) 1x1

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Xatral 10 mg®(Alfuzosin hidroklorür) 1x1

Vesicare 5 mg (solifenacin) 1x1

Doxium 500mg ® (Dobesilat kalsiyum) 2x1

Trental 600 ® (pentoksifilin) 2x1

Desal 40 mg ® (furosemid)1x1

- Enapril 10 mg ®(enalapril maleat) 1x1
  - Kısa etkili bir antihipertansif etki için 2x1 verilmesi uygun
  - Hasta çok ilaç içmekten yakınıyor
  - Uzun etkili ACEİ/ARB grubu antihipertansif ilaç ile değiştirilmelidir

NEDEN

Mümkünse uzun etkili ilaçlar reçetele

Kullandığı İlaçlar

Glifor1000 mg ® (metformin) 2x1

Glucobay 100® (akarboz) 3x1

Amarly 2 mg (glimeperid) 1x1

Gabateva®(gabapentin)3x 500 mg

Thioctacide tb ® (alfalipoik asit) 1x1

Eslopram20 mg ® (citalopram) 1x1

Diazem 2mg ® (Diazepam) lh

Laroxyl 10®(Amitriptilin Hidroklorür) 1x1

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Vasoxen 5 mg tb® (nebivolol) 1x1

Xatral 10 mg®(Alfuzosin hidroklorür) 1x1

Vesicare 5 mg (solifenacin) 1x1

Doxium 500mg ® (Dobesilat kalsiyum) 2x1

Trental 600 ® (pentoksifilin) 2x1

Desal 40 mg ® (furosemid)1x1

- Vasoxen 5 mg tb® (nebivolol) 1x1
  - Periferik arter hastalığı tanısı olan hastamızda uygun değil

Kullandığı İlaçlar

Glifor1000 mg ® (metformin) 2x1

Glucobay 100® (akarboz) 3x1

Amarly 2 mg (glimeperid) 1x1

Gabateva®(gabapentin)3x 500 mg

Thioctacide tb ® (alfalipoik asit) 1x1

Eslopram20 mg ® (citalopram) 1x1

Diazem 2mg ® (Diazepam) lh

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Xatral 10 mg®(Alfuzosin hidroklorür) 1x1

Vesicare 5 mg (solifenacin) 1x1

Doxium 500mg ® (Dobesilat kalsiyum) 2x1

Trental 600 ® (pentoksifilin) 2x1

Desal 40 mg ® (furosemid)1x1

- Xatral 10 mg®(Alfuzosin hidroklorür) 1x1
  - Alfa-bloker, benign prostat hipertrofisi (BPH) nedeni ile mesane boynunu gevşeterek miksiyonu kolaylaştırıyor
  - İdrar inkontinansı olduğu söylenen bir hastada uygun bir ilaç değil
    - Önce hastanın BPH tanısı için üriner sistem USG, prostat volümü ölçümü ve postmiksiyonel residü tayini yapılmalıdır
      - Nörojenik mesane?

Kesilebilir!!!

Kullandığı İlaçlar

Glifor1000 mg ® (metformin) 2x1

Glucobay 100® (akarboz) 3x1

Amarly 2 mg (glimeperid) 1x1

Gabateva®(gabapentin)3x 500 mg

Thioctacide tb ® (alfalipoik asit) 1x1

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Xatral 10 mg®(Alfuzosin hidroklorür) 1x1

Vesicare 5 mg (solifenacin) 1x1

Doxium 500mg ® (Dobesilat kalsiyum) 2x1

Trental 600 ® (pentoksifilin) 2x1

Desal 40 mg ® (furosemid)1x1

- Vesicare 5mg® (solifenacin) 1x1
  - İdrar inkontinansı nedeni ile verilmiş bir antikolinerjik
    - BPH nedeni ile Xatral 10 mg 1x1 veriliyor, aynı zamanda mesane gövdesinde gevşemeye neden olan bir antikolinerjik (Vesicare 5mg) veriliyor
    - Kötü regüle bir DM var, şekeri regüle edilirse inkontinansı da düzelebilir

Kesilebilir!!!

Kullandığı İlaçlar

Glifor1000 mg ® (metformin) 2x1

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Gabateva®(gabapentin)3x 500 mg

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Xatral 10 mg®(Alfuzosin hidroklorür) 1x1

Vesicare 5 mg (solifenacin) 1x1

Doxium 500mg ® (Dobesilat kalsiyum) 2x1

Trental 600 ® (pentoksifilin) 2x1

Desal 40 mg ® (furosemid)1x1

- Doxium 500mg ® (Dobesilat kalsiyum) 2x1
  - Kronik venöz yetmezlik tedavisinde kullanılır
  - Etkinliği çok kanıtlanmamış bir ilaç
  - Uzun süre kullanmanın bir faydası yok

Kesilmeli!!!

Kullandığı İlaçlar

Glifor1000 mg ® (metformin) 2x1

Glucobay 100® (akarboz) 3x1

Amarly 2 mg (glimeperid) 1x1

Gabateva®(gabapentin)3x 500 mg

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Vesicare 5 mg (solifenacin) 1x1

Doxium 500mg ® (Dobesilat kalsiyum) 2x1

Trental 600 ® (pentoksifilin) 2x1

Desal 40 mg ® (furosemid)1x1

- Trental 600 ® (pentoksifilin) 2x1
  - Periferik arter hastalığı tedavisinde verilir
  - Kar zarar dengesi yapıldığında bu hastada kesilmesi uygundur

Kesilmeli!!!

Kullandığı İlaçlar

Glifor1000 mg ® (metformin) 2x1

Glucobay 100® (akarboz) 3x1

Amarly 2 mg (glimeperid) 1x1

Gabateva®(gabapentin)3x 500 mg

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Xatral 10 mg®(Alfuzosin hidroklorür) 1x1

Vesicare 5 mg (solifenacin) 1x1

Doxium 500mg ® (Dobesilat kalsiyum) 2x1

Trental 600 ® (pentoksifilin) 2x1

Desal 40 mg ® (furosemid)1x1

- Desal 40 mg ®(furosemid)1x1
  - Ayaklarındaki ödemleri için verilmiş
    - İdrar inkontinansını kolaylaştıracağından
    - Yaşlıda elektrolit imbalansına yol açacağından

Kesilmeli!!!

Kullandığı İlaçlar

Glifor1000 mg ® (metformin) 2x1

Glucobay 100® (akarboz) 3x1

Amarly 2 mg (glimeperid) 1x1

Gabateva®(gabapentin)3x 500 mg

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Eslopram20 mg ® (citalopram) 1x1

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Vasoxen 5 mg tb® (nebivolol) 1x1

Xatral 10 mg®(Alfuzosin hidroklorür) 1x1

Vesicare 5 mg (solifenacin) 1x1

Doxium 500mg ® (Dobesilat kalsiyum) 2x1

Trental 600 ® (pentoksifilin) 2x1

Desal 40 mg ® (furosemid)1x1

Kullanması önerilen ilaçlar

1. Coraspin 100 mg 1x1
2. Glifor 1000 mg 2x1
3. Lantus 18 Ü
4. Lansoprol 30mg 1x1
5. Pritor 80 mg 1x1
6. Cymbalta 30 mg 1x1
7. İmovan 7.5 mg 1x1

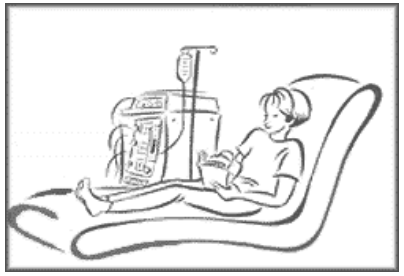
SONUÇ

Mevcut ilaç tedavisini gözden geçir (her bir ilaç için)

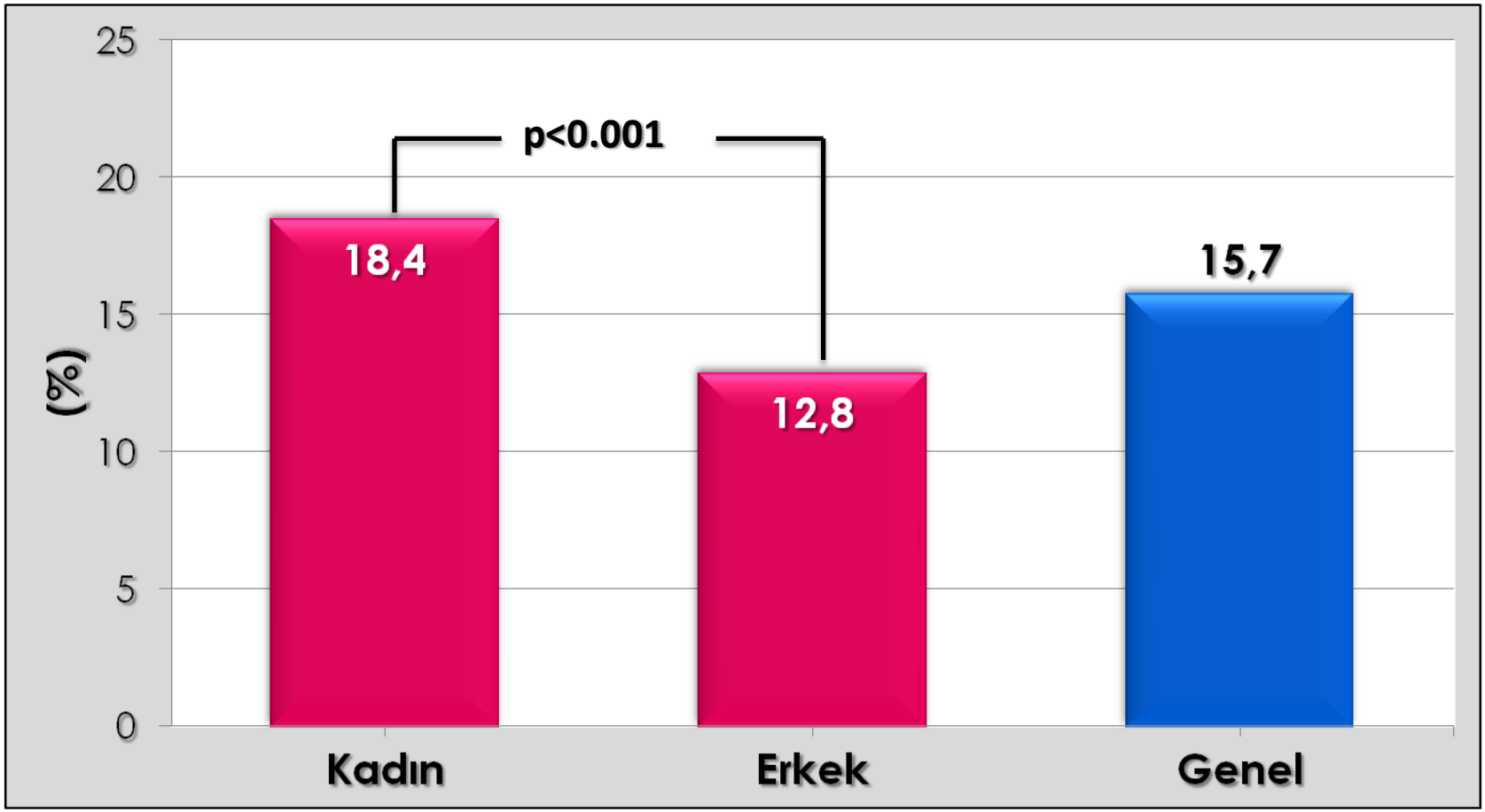
Hastanın tanıları ile tedavilerini eşleştir

Bu karşılaştırma yılda en az 1 kez ve hastanın mevcut durumunda kötüleşme olan her zaman tekrarlanmalı

KRONİK BÖBREK YETMEZLİĞİ OLAN HASTALARDA AKILCI İLAÇ KULLANIMI

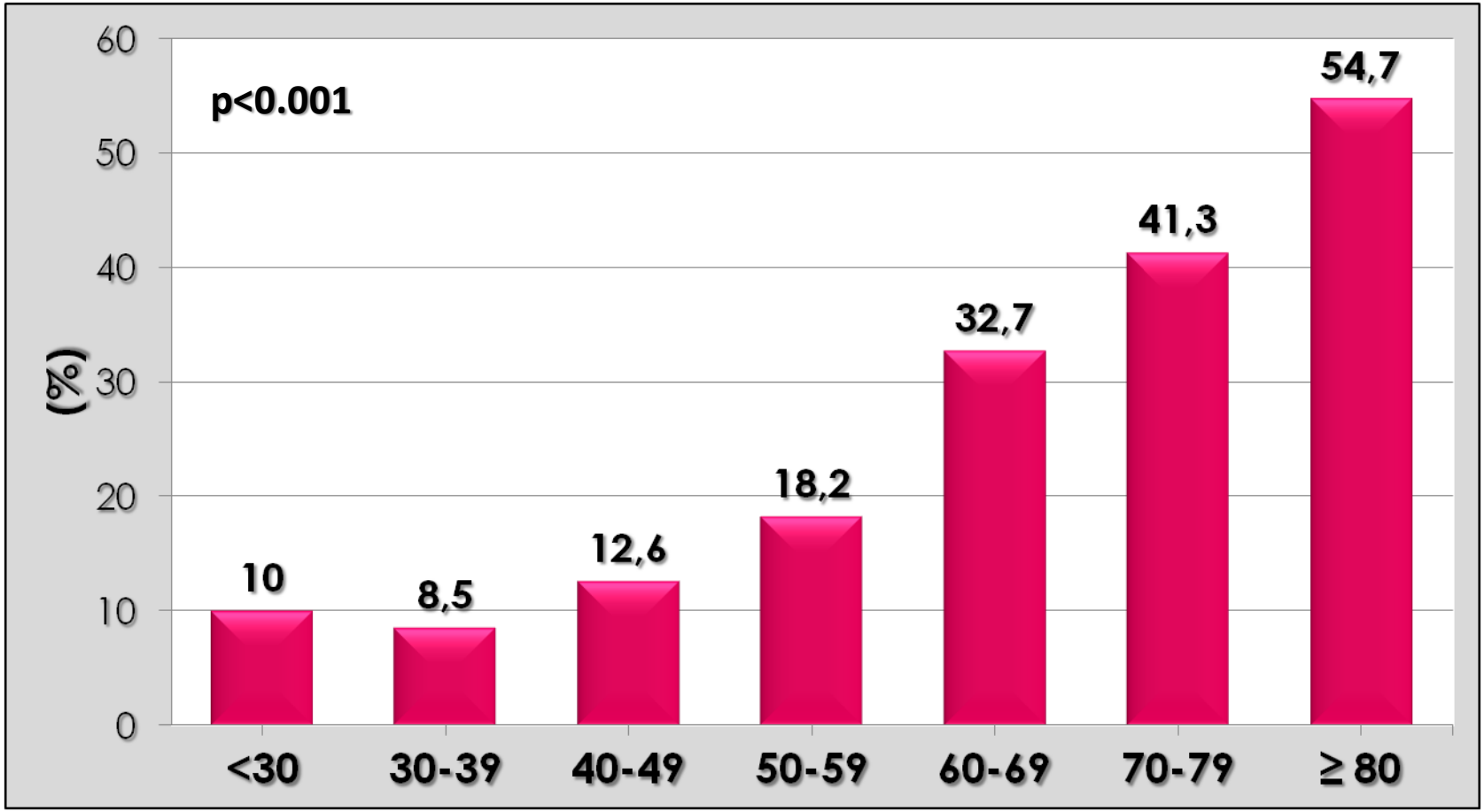


Türkiye'de kronik böbrek hastalığı prevalansı



CREDIT: Türkiye KBH Prevalans Araştırması

Yaş gruplarına göre kronik böbrek hastalığı prevalansı

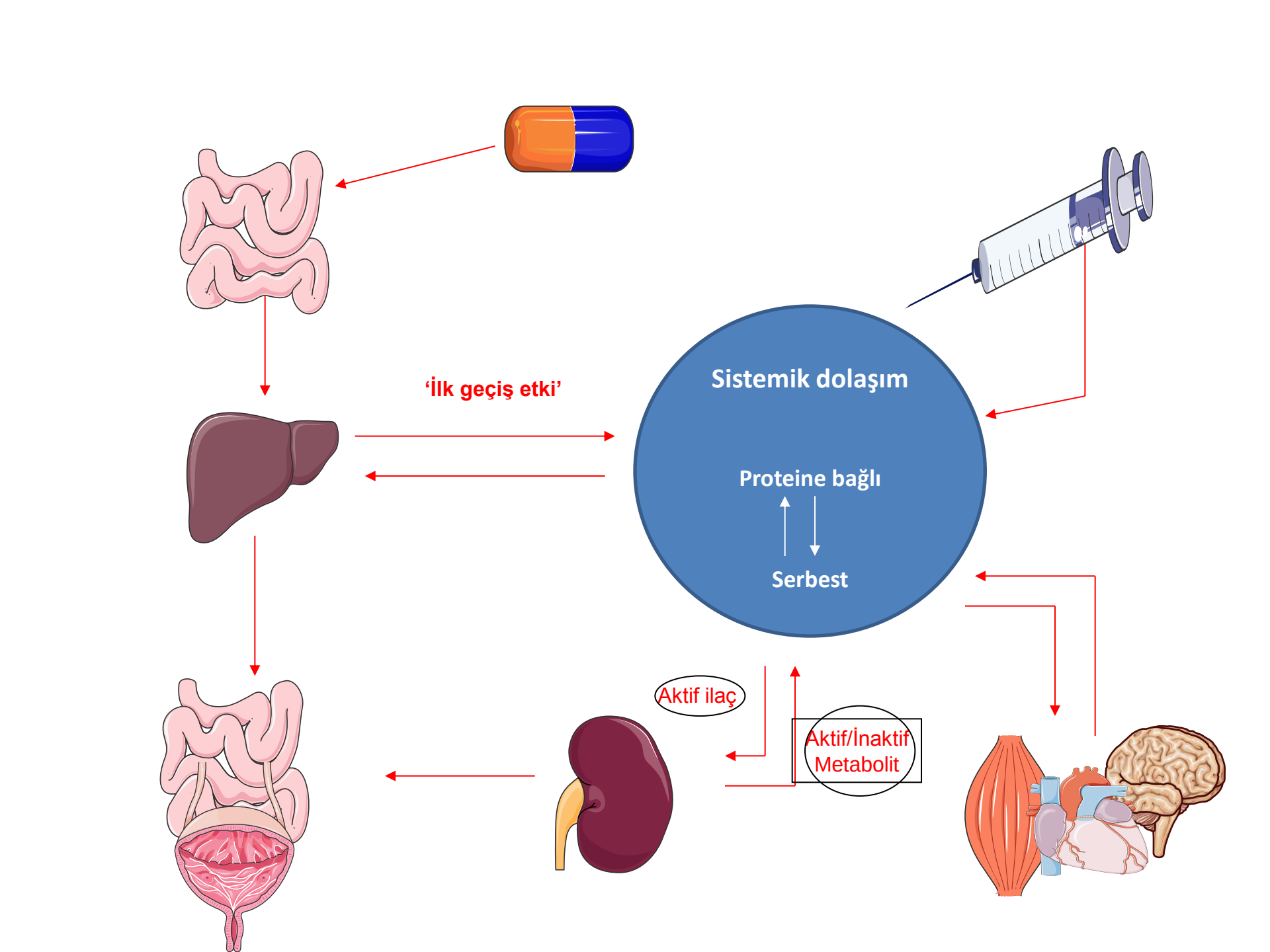


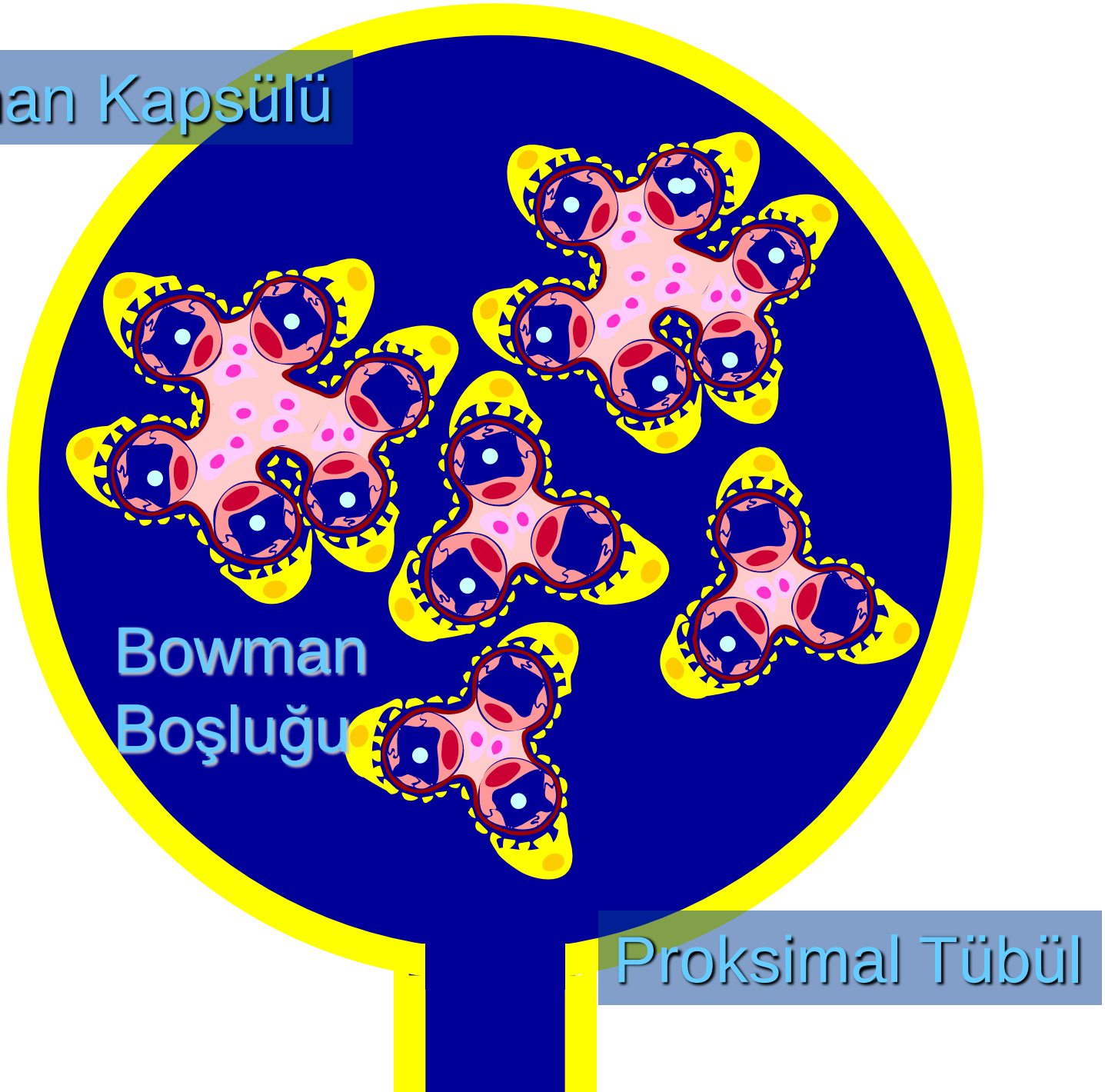
CREDIT: Türkiye KBH Prevalans Araştırması

CREDIT: Türkiye KBH Prevalans Araştırması

Renal ilaç eliminasyonu

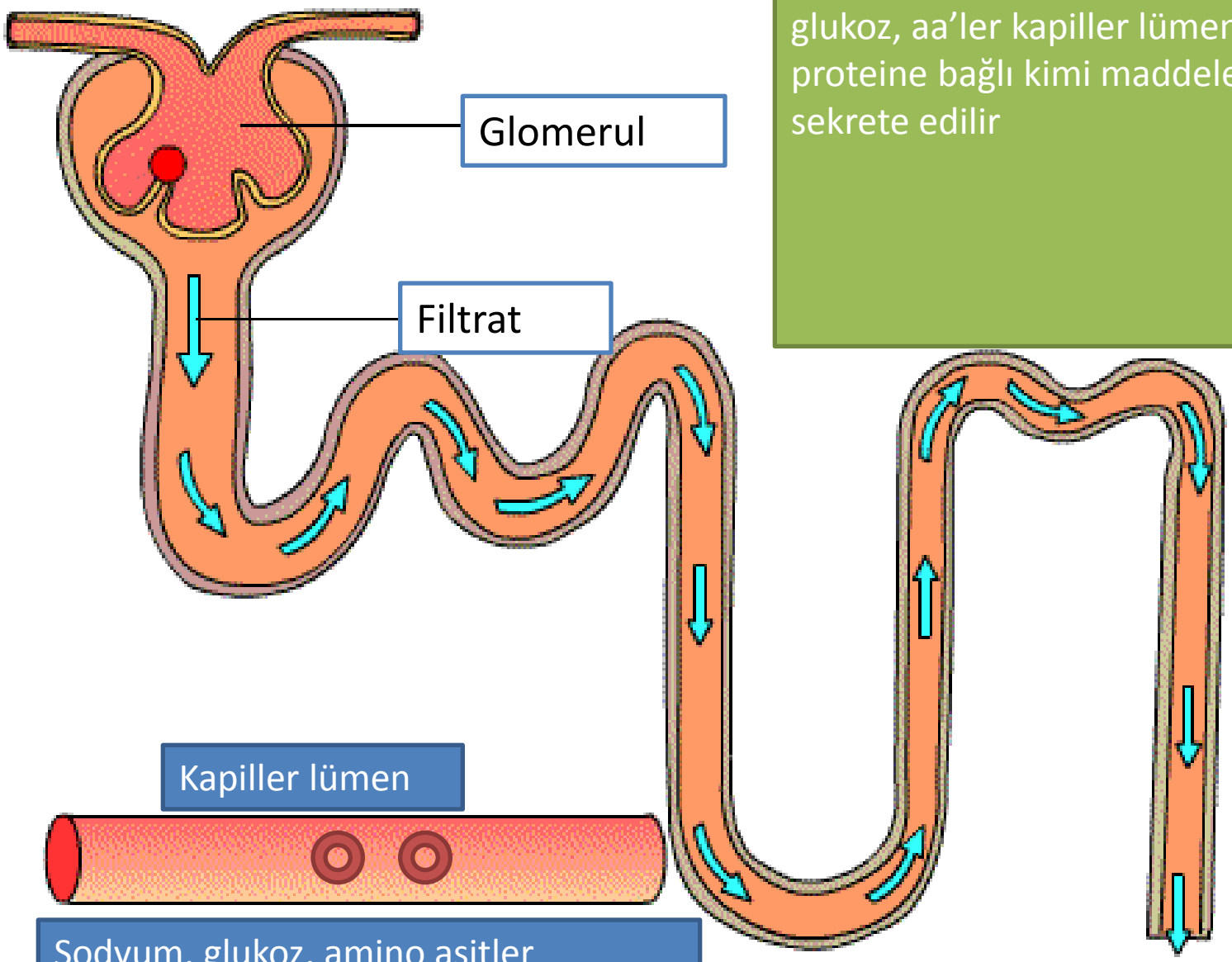
- 1. Glomeruler filtrasyon
- 2. Tübüler sekresyon
- 3. Tübüler katabolizma
  - GFR'ye bağımlı
  - Moleküler boyut, yük ve proteine bağlanma
    - Filtrasyıonu azaltır, tübüler sekresyonu artırır
- GFR azalırsa bu mekanizmalarla elimime edilen ilaçların yarı ömrü artar

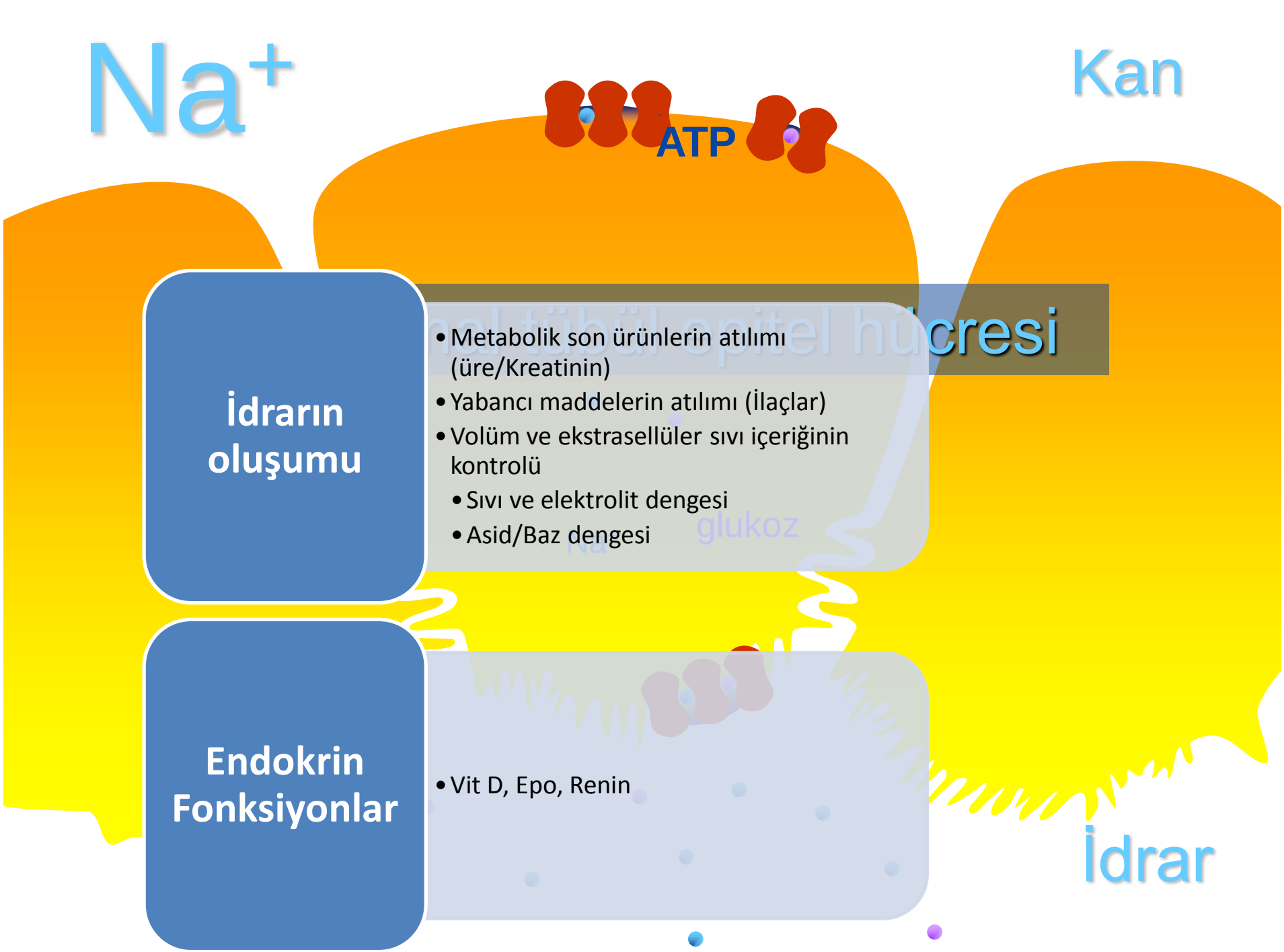

'İlk geçiş etki'
Sistemik dolaşım
Proteine bağlı
Serbest
Aktif ilaç
Aktif/İnaktif
Metabolit

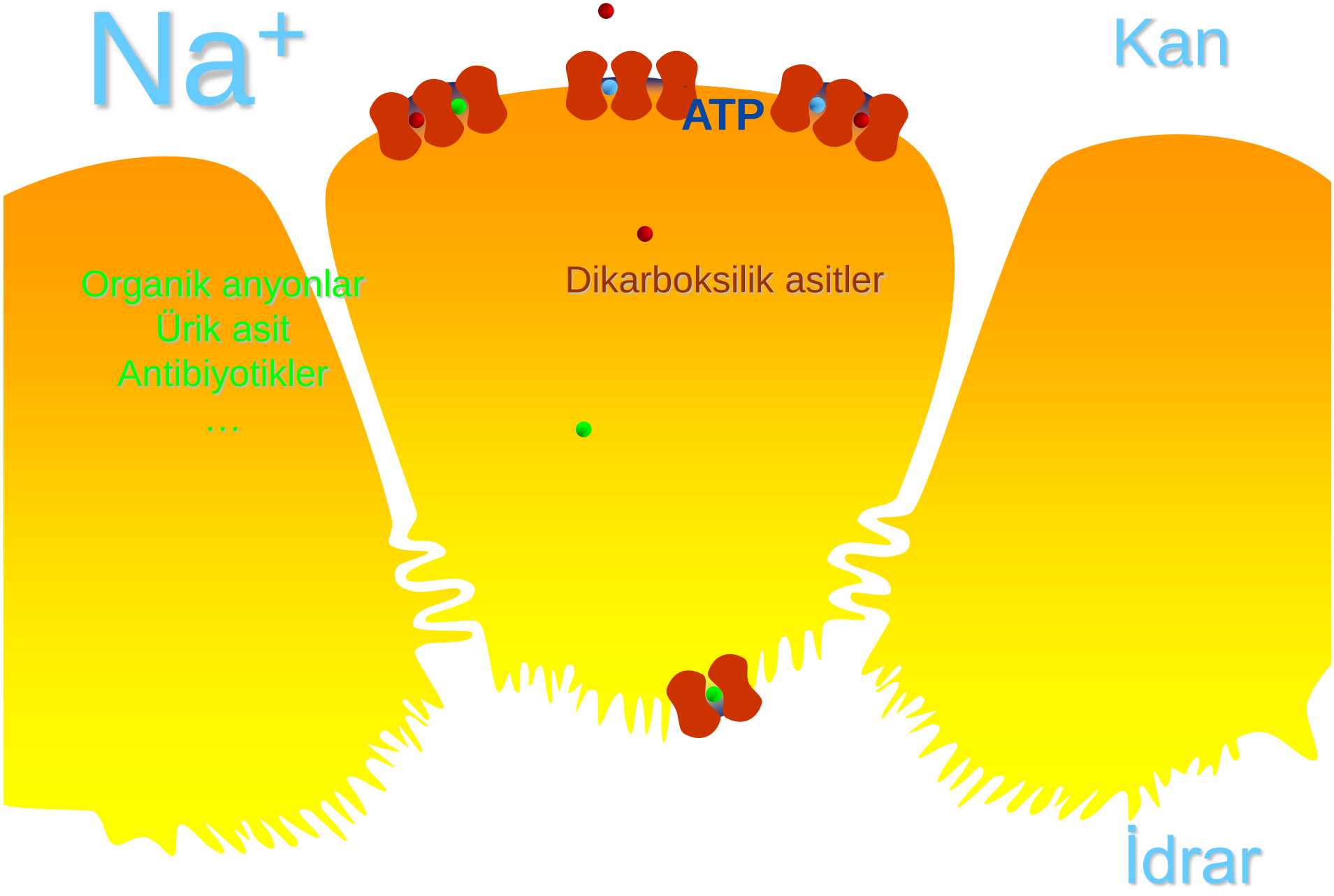

Bowman Kapsülü
Bowman Boşluğu
Proksimal Tübül

Albümine bağlı ilaçlar lümende kalır.

Glomeruler filtrata geçen sodyum, glukoz, aa'ler kapiller lümene geçerken proteine bağlı kimi maddeler lümene sekrete edilir




Na+
Kan
ATP
İdrarın oluşumu
• Metabolik son ürünlerin atılımı (üre/Kreatinin)
• Yabancı maddelerin atılımı (İlaçlar)
• Volüm ve ekstrasellüler sıvı içeriğinin kontrolü
• Sıvı ve elektrolit dengesi
• Asid/Baz dengesi
Endokrin Fonksiyonlar
• Vit D, Epo, Renin
İdrar

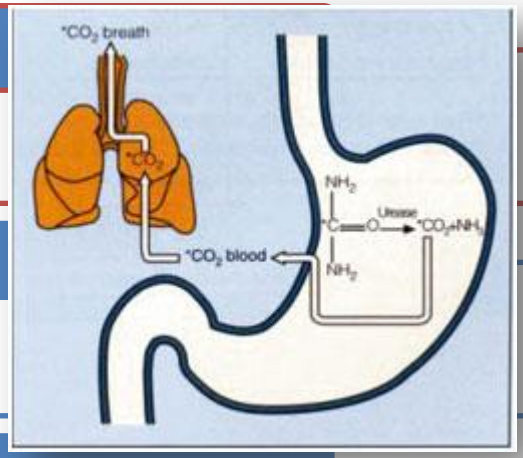

Na+
Kan
ATP
Organik anyonlar
Ürik asit
Antibiyotikler
…
Dikarboksilik asitler
İdrar

ÜREMİ-İLAÇ ABSORBSİYONU

Bulantı, kusma

Gecikmiş gastrik boşalma

- gastroparezi



Hızlanmış gastrik boşalma

- ishal

Artmış gastrik pH (gastrik üreaz)

- $(NH_2)_2CO + H_2O \rightarrow CO_2 + 2NH_3$

KBY için kullanılan ilaçlar

Fosfor bağlayıcılar → Şelasyon

DAĞILIM VOLÜMÜ (Vd)

V_d = Vücuttaki ilaç miktarı/ Plazma konsantrasyonu

- Proteinlere bağlananlarda
- Suda çözünenlerde

- Yağda çözünenlerde

Renal yetersizlik ilaçların non-renal biyotransformasyonunu da etkileyebilir

Mikrozomal oksidasyonda bozulma

- Sitokron p450 izoformlarında %50 oranında azalmalar bildirilmiştir

Renal yetersizlikte glukuronidasyon da bozulur

KC'den metabolize olan ilaçların proteine bağlanmasını da bozarak da ilaç eliminasyonunu etkileyebilir

İlaç metabolizması sırasında oluşan aktif veya toksik ara metabolitler de renal yetersizlikte birikebilir

Çoğu zaman renal yetersizlikteki dozlar, stabil KBY hastalarından elde edilen sonuçlara göre yapılmaktadır.

- Bu sonuçların diyaliz ve ABY hastalarına uygulanması zaman zaman sıkıntıya yol açabilir.

ÜREMİK HASTADA

Doz modifikasyonu

- Yükleme dozunda değişiklik yok
  - Yükleme dozu = V_d × İVA × Cp
    - *V_d: dağılım volümü (L/kg),*
    - *İVA: ideal vücut ağırlığı (kg)*
    - *Cp: ilacın istenilen plazma konsantrasyonu*
- İdame tedavi
  - Doz aralarının uzatılması
    - (yarılanma süresine göre)
  - Dozun azaltılması
  - Her iki uygulama birden

Brenner: The Kidney, 8th Edition, 2010

ÜREMİK HASTADA

Doz: Normal doz x D_f

- D_f = normal $t_{1/2}$ / böbrek yetmezliğindeki $t_{1/2}$
- Terapötik aralığı dar
- Yarılanma ömrü kısa

Doz aralığı: Normal doz aralığı x D_f

- Terapötik aralığı geniş
- Yarılanma ömrü uzun

Massry and Glassock's Textbook of Nephrology,2001

DİYALİZİN İLAÇ DÜZEYİNE ETKİSİ

HEMODİYALİZDE İLAÇ KLİRENSİNİ ETKİLEYEN UNSURLAR

- Molekül ağırlığı (>500 Dalton)
- Suda çözünürlük
- Proteine bağlanma oranı
- Membran tipi ve klirensi (kuprofan/polisülfon)
- Diyalizer yüzey alanı
- Diyalizat akım hızı
- Tedavi süresi

DİYALİZİN İLAÇ DÜZEYİNE ETKİSİ

Periton diyalizi çok etkin değil

Devamlı renal replasman tedavisi

- Serum proteinlerine bağlanma oranı
- Dağılım volümü

The Renal Drug Book®

ONLINE EDITION

PROVIDING DOSE GUIDELINES FOR ADULT DRUG PRESCRIPTIONS IN RENAL FAILURE

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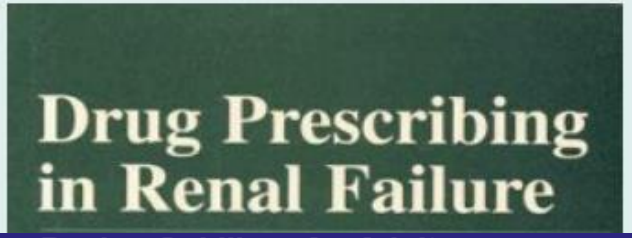
Drug Prescribing in Renal Failure



Dosing Guidlines for Adults

Drug Detail for Adult Drugs

Digoxin
Antihypertensive and Cardiovascular Agents
Cardiovascular Agents
Cardiac Glycosides

General Toxicity Notes :	Add to uremic gastrointestinal symptoms. Toxicity enhanced by hypokalemia and hypomagnesemia during dialysis.
Excreted Unchanged % :	76-85
Half-Life (NormalESRD) hours :	36-44/80-120
Plasma Protein Binding % :	20-30
Volume of Distribution L/kg :	5-8
Dose for Normal Renal Function :	1.0-1.5 mg load, then 0.25-0.5 mg q24h
Second Dose :	D, I
Adjustment for Renal Failure Method :	100% q24h [A]
Adjustment for Renal Failure GFR, mL/min >50 [Recommended Level] :	25-75% q36h [A]
Adjustment for Renal Failure GFR, mL/min 10-50 [Recommended Level] :	10-25% q48h [A]
Adjustment for Renal Failure GFR, mL/min <10 [Recommended Level] :	IHD: None
Supplement for Dialysis [Recommendation Level]: IHD :	PD: None
Supplement for Dialysis [Recommendation Level]: PD :	CRRT: Dose for GFR 10-50,monitor serum concentration, [D]
Supplement for Dialysis [Recommendation Level]: CRRT :	Sonnenblick M, Abraham AS, Meshulam Z, Eylath U. Correlation between manifestations of digoxin toxicity and serum digoxin, calcium, potassium, and magnesium concentrations and arterial pH. Br Med J (Clin Res Ed). 1983; 286: 1089-91. [PMID: 6404339]
References :	Decrease loading dose by 50% in ESRD. Radioimmunoassay may overestimate serum levels in uremia. Clearance decreased by amiodarone, spironolactone, quinidine, verapamil. Hypokalemia, hypomagnesemia enhance toxicity. Vd and total body clearance decreased in ESRD. Serum level after 12 dose hours is best guide in ESRD. Digoxin immune antibodies can treat severe toxicity in ESRD.
Toxicity Notes :	

Recommended Maintenance Drug Doses in Patients with Renal Impairment and in HD/CAPD/CVVH

Laurence K. Chan and Siu-Kim Chan

This chapter summarizes the dosage of common medication for subjects with normal or impaired renal function. In the latter, the dose is adjusted according to the renal function defined by the glomerular filtration rate (GFR). The medication regime of frequently used drugs for patients undergoing dialytic renal replacement therapy — herit hemodialysis (HD), continuous ambulatory peritoneal dialysis (CAPD), or continuous venovenous hemofiltration (CVVH) — is also outlined.

The kidney may be the site for degradation of certain compounds such as insulin. Electrolyte disturbance and renal impairment may confound drug effects (e.g. hypokalemia and digitalis toxicity). Concurrent drug use may also interfere with the metabolism and excretion of individual compounds (e.g. reduced renal excretion of penicillin by probenecid). The dialytic clearance of drugs should be taken into consideration in patients on dialysis. Hemodialysis is very efficient in clearing small molecules with low protein binding. Scheduled or supplementary doses after dialysis should be given. The peritoneal clearance of drugs can be estimated from the molecular weight of the compound:

Drugs	Normal dosage	Dosage adjustment in renal failure			HD	CAPD	CVVH
		GFR > 50	GFR 10–50	GFR < 10			
32.1 Antibiotics[a]							
32.1.1 *Aminoglycoside Antibiotics*							
Gentamicin	1.7 mg/kg q8h	q12–24h	q24–48h	q48–72h	1/2 full dose after HD	3–4 mg/L/d	dose for GFR 10–50
Tobramycin	1.7 mg/kg q8h	q12–24h	q24–48h	q48–72h	1/2 full dose after HD	3–4 mg/L/d	dose for GFR 10–50
Netilmicin	2 mg/kg q8h	q12–24h	q24–48h	q48–72h	1/2 full dose after HD	3–4 mg/L/d	dose for GFR 10–50
Amikacin	7.5 mg/kg q12h	q12–24h	q24–48h	q48–72h	1/2 full dose after HD	15–20 mg/L/d	dose for GFR 10–50
Streptomycin	7.5 mg/kg q12h	q24h	q24–72h	q72–96h	1/2 normal dose after HD	20–40 mg/L/d	dose for GFR 10–50

Drugs	Normal dosage	Dosage adjustment in renal failure			HD	CAPD	CVVH
		GFR > 50	GFR 10–50	GFR < 10			
32.1.2 ***Cephalosporin***							
Ceftibuten	400 mg q12h	normal dose	normal dose	50% dose	300 mg after HD	dose for GFR < 10	dose for GFR 10–50
Cefuroxime	250–500 mg bid	normal dose	normal dose	normal dose	dose after HD	dose for GFR < 10	no data
Cefuroxime (IV)	0.75–1.5g q8h	q8h	q8–12h	q12–24h	dose after dialysis	dose for GFR < 10	1 g q12h
Cefazolin	1–2 g q8h	q8h	q12h	q12–24h	0.5–1 g after HD	0.5 g q12h	dose for GFR 10–50
Cefepime	1–2 g q8h	q8–12h	q12h	q24h	1 g after HD	dose for GFR < 10	dose for GFR 10–50
Cefoperazone/ Sulbactam	1–2 g q12h	normal dose	1 g q12h	500 mg q12h	1 g after HD	dose for GFR < 10	no data
Ceftazidime	1–2 g q8h	q8h	q12h	q24h	1 g after HD	0.5 g/d	dose for GFR 10–50
Cefotaxime	1–2 g q6–q8h	q8h	q12h	q12–24h	1 g after HD	1 g/d	1 g q12h
Ceftriaxone	1–2 g q12–24h	normal dose	normal dose	normal dose	dose after HD	750 mg q12h	dose for GFR 10–50
Cephalexin	250–500 mg tid	normal dose	normal dose	normal dose	dose after HD	dose for GFR < 10	no data

Drugs	Normal dosage	Dosage adjustment in renal failure			HD	CAPD	CVVH
		GFR > 50	GFR 10–50	GFR < 10			
Piperacillin/ Tazobactam	4.5/3.375 g q6–8h	normal dose	3.375/2.25 g q6h	2.25 g q6–8h	dose after HD	dose for GFR < 10	dose for GFR 10–50
Ticarcillin/ Clavulanate	3.1 g q4–6h	q8h	q8–12h	q12h	suppl dose after HD	dose for GFR < 10	dose for GFR 10–50
32.1.5 ***Quinolones***							
Ciprofloxacin	200–400 mg q12h	normal dose	q12–24h	q24h	200 mg q24h	200 mg q24h	200 mg q12h
Levofloxacin	500 mg daily	normal dose	250 mg q24–48h	250 mg q48h	dose for GFR < 10	dose for GFR < 10	dose for GFR 10–50
Moxifloxacin	400 mg daily	normal dose	normal dose	normal dose	no adjustment	no adjustment	no adjustment
Nalidixic acid	1 g q6h	normal dose	avoid use	avoid use	avoid use	avoid use	no data
Norfloxacin	400 mg q12h	q12h	q12–24h	q24h	dose for GFR < 10	dose for GFR < 10	no data
Ofloxacin	200–400 mg q12h	q12h	q12–24h	q24h	100–200 mg after HD	dose for GFR < 10	300 mg/d

Drugs	Normal dosage	Dosage adjustment in renal failure			HD	CAPD	CVVH
		GFR > 50	GFR 10–50	GFR < 10			
32.1.6 ***Macrolides***							
Azithromycin	250–500 mg bid	normal dose	normal dose	normal dose	no adjustment	no adjustment	no adjustment
Clarithromycin	500 mg bid	normal dose	normal dose	normal dose	no adjustment	no adjustment	no adjustment
Clindamycin	150–450 mg tid	normal dose	normal dose	normal dose	no adjustment	no adjustment	no adjustment
Erythromycin	250–500 mg qid	normal dose	normal dose	normal dose	no adjustment	no adjustment	no adjustment
32.1.7 ***Carbapenem***							
Aztreonam	0.5–2 g q8–12h	normal dose	50–100% dose	25% dose	suppl 12.5% dose	dose for GFR < 10	q12h
Ertapenem	1 g q24h	normal dose	0.5–1 g q24h	500 mg q24h	suppl 150 mg if last dose	no data	no data
Imipenem/ Cilastatin	250–500 mg q6h	500 mg q8h	250–500 mg q8–12h	250 mg q12h	dose after HD	dose for GFR < 10	dose for GFR 10–50
Meropenem	1 g q8h	1 g q8h	0.5–1g q12h	0.5–1 g q24h	dose after HD	dose for GFR < 10	dose for GFR 10–50
32.1.8 ***Other Antibiotics***							
Doxycycline	100–200 mg/d qd to bid dose	normal dose	normal dose	normal dose	no adjustment	no adjustment	no adjustment
Metronidazole	500 mg q6–8h	normal dose	normal dose	normal dose	dose after HD	dose for GFR < 10	dose for GFR 10–50
Pentamidine	4 mg/kg/d	q24h	q24–36h	q48h	no adjustment	no adjustment	no adjustment
Trimethoprim/ Sulfamethoxazole	960 mg bid q12h	q18h	q12h (50%)	q24h (50%)	dose after HD	q24h	q18h
Vancomycin	1 g q12h	q12h	q24–48h	q48–72h	suppl 0.5–1 g after HD	q48–72h	500 mg q12h

Drugs	Normal dosage	Dosage adjustment in renal failure			HD	CAPD	CVVH
		GFR > 50	GFR 10–50	GFR < 10			
32.2 Antituberculosis Antibiotics							
Ethambutol	15–25 mg/kg/d	normal dose	q24–36h	q48h	dose after HD	dose for GFR < 10	dose for GFR 10–50
Isoniazid	300 mg daily	normal dose	normal dose	may reduce (50% in slow acetylator)	dose after HD	dose for GFR < 10	dose for GFR < 10
Rifampicin	300–600 mg daily	normal dose	normal dose	normal dose	no adjustment	no adjustment	no adjustment
Pyrazinamide	15–30 mg/kg/d	normal dose	reduce dose to 12–20 mg/kg/d or usual dose 3 times per week	avoid use	avoid use	avoid use	avoid use

Table 1 Demographic features and outcome results of patients

Patient no.	Age/ Gender	Renal failure (acute/chronic)	Other diagnoses	BUN/ creatinine	Antibiotic (name, dose)	Indication for antibiotic therapy	Latent time (days)	Clinical signs	Response of epileptic activity to i.v. diazepam	Maintenance antiepileptic drug	Outcome
1	55/F	Acute	Polycystic kidney, cholecystectomy and bile duct operation	56/3.7	Cefoperazone/ sulbactam 2 × 1 g	Acute pyelonephritis	10	Contractions of face and neck/ generalized convulsion	Disappeared	Phenytoin	Admitted to ICU, resolved with discontinued drug
2	61/F	Chronic (HD+)	Multiple myeloma (MM)	81/8.0	Cefepime 2 × 1 g	Febrile neutropenia	8	Contractions of eyelids, chin, hands and arms	Disappeared	Clonazepam	Still on 3/7 HD program, MM is not in complete remission
3	52/M	Chronic	Transplanted kidney (chronic rejection), TRAS, HD (+)	75/2.8	Imipenem/ Cilastatin 2 × 0.5 g	Pneumonia	4	Contractions of face muscles, stupor	???	Phenytoin	Patient was on CsA, blood levels were normal, died of heart failure after 15 days
4	67/F	Chronic (acute HD+)	Multiple myeloma	64/4.8	Ceftazidime 3 × 2 g/ead, Ciprofloxacin 2 × 200 mg	Febrile neutropenia	12	Stupor, rare limb contractions	Disappeared	Clonazepam	HD administrated to the patient again, after 3 days died of CPA
5	85/F	Chronic	DM + HT, late hemorrhagic CVA	22/1.5	Cefepime 2 × 2 g	Pneumonia	7	Stupor	None-responsive	–	General anesthesia applied to the patient whose status presentation and mental state did not improve and was admitted to ICU
6	29/M	Chronic (HD+)	Operated brain abscess	62/2.4	Cefepime 2 × 2 g	Brain abscess	21	Stupor	Disappeared	Phenytoin	
7	75/F	Acute (HD+)	Congestive heart failure	55/2.2	Cefepime 2 × 2 g, Vancomycin 1 × 1 g	Pneumonia	3	Confusion	None-responsive	Phenytoin	Died of sepsis + congestive heart failure on day 4
8	83/F	Chronic	Lung tuberculosis, chronic atrial	?/6.1	Cefepime 2 × 1 g	Pneumonia	7	Stupor	Partial	Phenytoin	Consciousness improved
9	33/F	Chronic	Chronic allograft nephropathy, febrile neutropenia, cellulitis, DM	74/6.0	Cefepime 2 × 1 g, Ciprofloxacin 2 × 200 mg (Vancomycin 1 × 1 g 2/7)	Febrile neutropenia, cellulitis	9	Disorientation, loss of consciousness	Disappeared	Phenytoin	Cytopenia improved, creatinine decreased to 2.8 mg/dl. MMF was started again. He was not receiving CsA
10	48/F	Chronic (PD+)	End stage renal failure (amyloidosis?)	56/7.5	Ciprofloxacin 2 × 200 mg (day 4), Cefepime 2 × 1 g (day 6)	Exacerbated bronchiectasis	6	Agitation, speech difficulty, hand tremor, loss of consciousness	Partial	–	Antibiotic discontinued, consciousness improved
11	58/F	Acute on chronic	Transplanted kidney + urinary infection, acute rejection	75/2.0	Cefepime 2 × 2 g, Clarithromycin 2 × 500	Transplanted kidney pyelonephritis	5	Impaired consciousness	Disappeared	–	Antibiotic discontinued, underwent HD, consciousness improved immediately
12	55/F	Acute	Refractory lymphoma, pancytopenia (after chemotherapy)	71/5.1	Cefepime 2 × 2 g, Amikacin 1 × 1 g	Febrile neutropenia	4	Loss of consciousness	None-responsive	–	Consciousness did not improve and died of sepsis

ICU intensive care unit, *HD* hemodialysis, *PD* peritoneal dialysis, *TRAS* transplanted renal artery stenosis, *CsA* cyclosporine_A, *CPA* Cardiopulmonary arrest, *CVA* Cerebrovascular accident, *ead* every other day, *DM* diabetes mellitus, *HT* hypertension, *MMF* mycophenolate mofetil

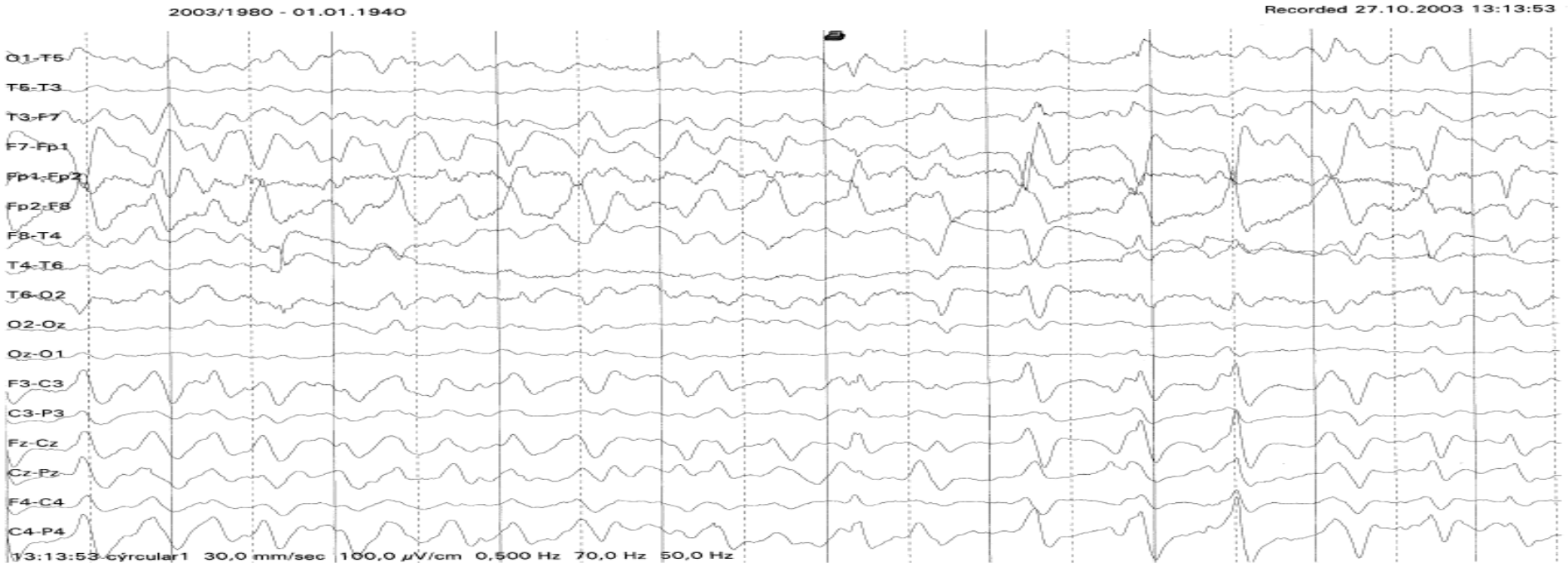


Fig. 1 EKG showing slowing with superimposed continuous or periodic bursts of sharp waves or sharp and slow wave activity

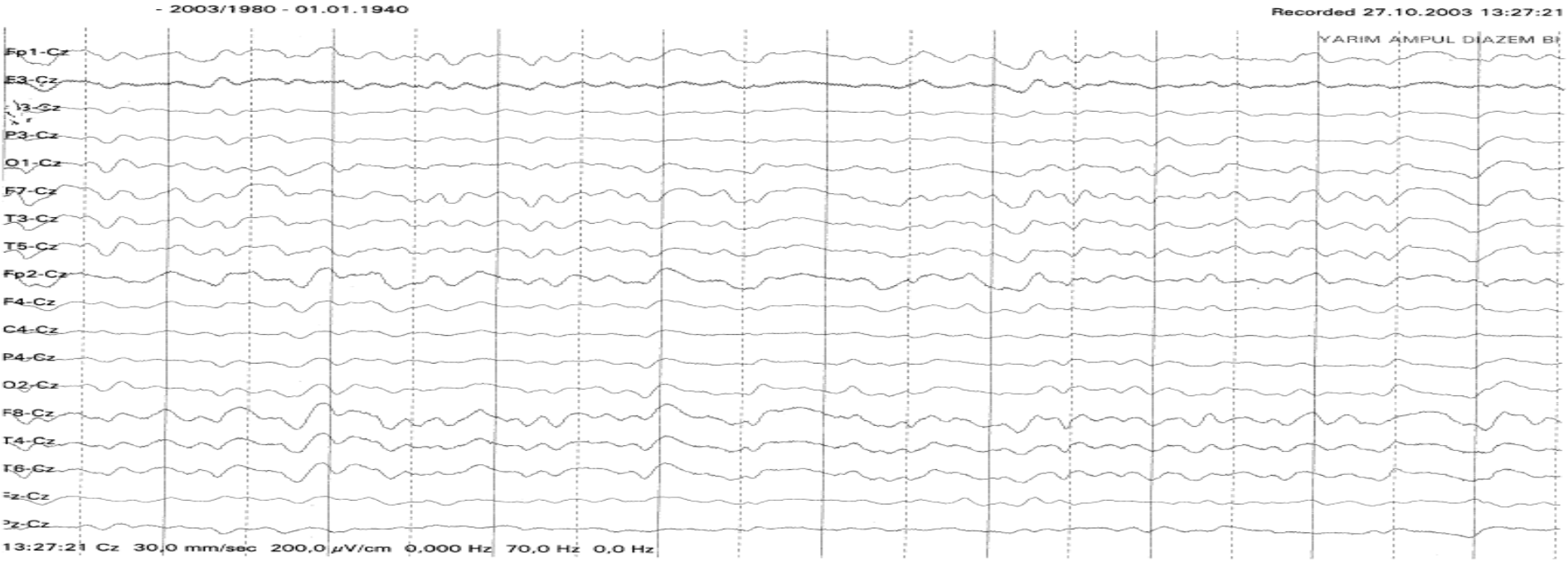


Fig. 2 EKG following administration of diazepam

Drugs	Normal dosage	Dosage adjustment in renal failure			HD	CAPD	CVVH
		GFR > 50	GFR 10–50	GFR < 10			
32.1.3 ***Penicillin (Oral)***							
Amoxicillin	500 mg tid	normal dose	normal dose	50–75%	dose after HD	250 mg q12h	dose for GFR 10–50
Amoxicillin/ Clavulanate	250–500 mg q8h	normal dose	q8–12h	q24h	dose during and after HD	q12h	q12h
Ampicillin	500 mg q6h	normal dose	normal dose	50–75%	dose after HD	250 mg q12h	dose for GFR 10–50
Cloxacillin	250–500 mg q6h	normal dose	normal dose	normal dose	no adjustment	no adjustment	no adjustment
32.1.4 ***Penicillin (IV)***							
Ampicillin	1–2 g q6h	q6h	q8h	q12h	dose after HD	250 mg q12h	dose for GFR 10–50
Ampicillin/ Sulbactam	1.5–3 g q6–8h	normal dose	q8–12h	q24h	dose after HD	q24h	dose for GFR 10–50
Penicillin G	2–3 MU q4h	q4–q6h	q6h	q8h	dose after HD	dose for GFR < 10	dose for GFR 10–50
Piperacillin	3–4 g q4–6h	normal dose	normal dose	normal dose	dose after HD	dose for GFR < 10	dose for GFR 10–50

Drugs	Normal dosage	Dosage adjustment in renal failure			HD	CAPD	CVVH
		GFR > 50	GFR 10–50	GFR < 10			
32.3 Antifungal Agents							
Amphotericin B (lipid)	0.5–1.5 mg/kg/d	normal dose	normal dose	q24–36h	no adjustment	no adjustment	no adjustment
Fluconazole	200–800 mg/d	normal dose	normal dose	50% dose	200 mg after HD	dose for GFR < 10	dose for GFR 10–50
Flucytosine	25–37.5 mg/kg q6h	q12h	q12–24h	q24h	dose after HD	0.5–1 g/d	dose for GFR 10–50
Griseofulvin	125–250 mg q6h	normal dose	normal dose	normal dose	no adjustment	no adjustment	no adjustment
Itroconazole	200 mg q12h	normal dose	normal dose	50% dose	100 mg q12–24h	100 mg q12–24h	100 mg q12–24h
Ketoconazole	200–400 mg daily	normal dose	normal dose	normal dose	no adjustment	no adjustment	no adjustment
Terbinafine	250 mg daily	normal dose	use half-normal dose if CrCl < 50		no adjustment	no adjustment	no adjustment

Drugs	Normal dosage	Dosage adjustment in renal failure			HD	CAPD	CVVH
		GFR > 50	GFR 10–50	GFR < 10			
32.4 Antiviral Agents							
Acyclovir (oral)	200–800 mg 5x/d	normal dose	q8h	q12h	dose after HD	dose for GFR < 10	3.5 mg/kg/d
Acyclovir (IV)	5–10 mg/kg q8h	normal dose	q12–24h	50% q24h	dose after HD	50% daily	5–7.5 mg/kg/d
Adefovir	10 mg daily	normal dose	q48–72h	q1wk	dose after HD	no data	no data
Amantadine	100–200 mg q12h	normal dose	50% dose	25% dose	no adjustment	no adjustment	dose for GFR 10–50
Cidofovir	5 mg/kg qwk × 2 (induction), 5 mg/kg q2wk (maintenance)	50–100%	avoid use	avoid use	avoid use	avoid use	no data
Entecavir	0.5–1 mg daily	normal dose	q48–72h	q1wk	dose after HD	dose for GFR < 10	no data
Famciclovir	250–500 mg bid/tid	q8h	q12h	q24h	dose after HD	no data	dose for GFR 10–50

Drugs	Normal dosage	Dosage adjustment in renal failure			HD	CAPD	CVVH
		GFR > 50	GFR 10–50	GFR < 10			
Foscarnet	40–80 mg/kg q8h	20–40 mg/kg q8–24h according to CrCl (see package insert)			dose after HD	dose for GFR < 10	dose for GFR 10–50
Ganciclovir (IV)	5 mg/kg q12h	q12h	q24h	2.5 mg/kg qd	dose after HD	dose for GFR < 10	2.5 mg/kg q24h
Ganciclovir (PO)	1000 mg tid	1000 mg tid	1000 mg bid	1000 mg qd	dose after HD	dose for GFR < 10	no data
Lamivudine	150 mg bid (HIV)	100%	q24h	50 mg q24h	dose after HD	dose for GFR < 10	dose for GFR 10–50
	100 mg qd (HBV)	100%	50 mg q24h	25 mg q24h	dose after HD	dose for GFR < 10	dose for GFR 10–50
Ribavirin	500–600 mg q12h	normal dose	normal dose	normal dose	dose ater HD	dose for GFR < 10	dose for GFR 10–50
Ritonavir	600 mg q12h	normal dose	normal dose	normal dose	no adjustment	dose for GFR < 10	dose for GFR 10–50
Telbivudine	600 mg daily	normal dose	q48–72h	q96h	dose after HD	no data	no data

Drugs	Normal dosage	Dosage adjustment in renal failure			HD	CAPD	CVVH
		GFR > 50	GFR 10–50	GFR < 10			
Valacyclovir	500–1000 mg q8h	normal dose	50% dose	25% dose	dose after HD	dose for GFR < 10	dose for GFR 10–50
Zidovudine	300 mg q12h	normal dose	normal dose	100 mg q8h	dose after HD	dose for GFR < 10	100 mg q8h
32.5 Analgesics							
Acetaminophen	500 mg q4h	normal dose	normal dose	normal dose	no adjustment	no adjustment	dose for GFR 10–50
Acetylsalicylic acid	650 mg q4h	q4h	q4–6h	avoid	dose after HD	no adjustment	dose for GFR 10–50
Codeine	30–60 mg q4–6h	normal dose	75% dose	50% dose	no data	no data	dose for GFR 10–50
Fentanyl	individualized	normal dose	75% dose	50% dose	not applicable	not applicable	not applicable
Methadone	2.5–5 mg q6–8h	normal dose	normal dose	50–70% dose	no adjustment	no adjustment	no data
Morphine	20–25 mg q4h	normal dose	75% dose	50% dose	no adjustment	no data	dose for GFR 10–50
Naloxone	0.4–2 mg	normal dose	normal dose	normal dose	not applicable	not applicable	dose for GFR 10–50

Drugs	Normal dosage	Dosage adjustment in renal failure			HD	CAPD	CVVH
		GFR > 50	GFR 10–50	GFR < 10			
32.6 Antihypertensive Drugs and Diuretics							
32.6.1 *ACE Inhibitors*							
Benazepril	10–80 mg daily	normal dose	75% dose	25–50% dose	no adjustment	no adjustment	dose for GFR 10–50
Captopril	6.25–100 mg tid	normal dose	75% dose	50% dose	suppl 25–30% dose	no adjustment	dose for GFR 10–50
Enalapril	5 mg qd–20 mg bd	normal dose	75% dose	50% dose	suppl 20–25% dose	no adjustment	dose for GFR 10–50
Fosinopril	10 mg qd–20 mg bd	normal dose	normal dose	75% dose	no adjustment	no adjustment	dose for GFR 10–50
Lisinopril	2.5 mg qd–20 mg bd	normal dose	50–75% dose	25–50% dose	suppl 20% dose	no adjustment	dose for GFR 10–50
Perindopril	2–16 mg qd	normal dose	75% dose	25% dose	suppl 25–50% dose	no data	dose for GFR 10–50
Quinapril	10–20 mg qd	normal dose	75–100% dose	75% dose	suppl 25% dose	no adjustment	dose for GFR 10–50
Ramipril	2.5 mg qd–10 mg bd	normal dose	50–75% dose	25–50% dose	suppl 20% dose	no adjustment	dose for GFR 10–50

Drugs	Normal dosage	Dosage adjustment in renal failure			HD	CAPD	CVVH
		GFR > 50	GFR 10–50	GFR < 10			
32.6.2 ***Angiotensin II Receptor Blockers***							
Candesartan	16–32 mg qd	normal dose	normal dose	50% dose	no adjustment	no adjustment	no adjustment
Eprosartan	400–800 mg qd	normal dose	normal dose	normal dose	no adjustment	no adjustment	no adjustment
Irbesartan	150–300 mg qd	normal dose	normal dose	normal dose	no adjustment	no adjustment	no adjustment
Losartan	50–100 mg qd	normal dose	normal dose	normal dose	no data	no data	dose for GFR 10–50
Telmisartan	20–80 mg qd	normal dose	normal dose	normal dose	no adjustment	no adjustment	no adjustment
Valsartan	80–160 mg qd	normal dose	normal dose	normal dose	no adjustment	no adjustment	no adjustment
32.6.3 ***Beta Blockers***							
Atenolol	25–100 mg qd	normal dose	75% dose	50% dose	suppl 25–50 mg	no adjustment	dose for GFR 10–50
Carvedilol	3.125 mg bd–25 mg tid	normal dose	normal dose	normal dose	no adjustment	no adjustment	dose for GFR 10–50
Esmolol (IV)	50–300 mcg/kg/min	normal dose	normal dose	normal dose	no adjustment	no adjustment	no data
Labetalol	50–400 mg bid	normal dose	normal dose	normal dose	no adjustment	no adjustment	dose for GFR 10–50
Metoprolol	50–100 mg bid	normal dose	normal dose	normal dose	no adjustment	no adjustment	no adjustment
Nadolol	80 mg qd–160 mg bid	normal dose	50% dose	25% dose	suppl 40 mg	no adjustment	dose for GFR 10–50
Pindolol	10–40 mg bid	normal dose	normal dose	normal dose	no adjustment	no adjustment	dose for GFR 10–50
Propranolol	10–80 mg tid	normal dose	normal dose	normal dose	no adjustment	no adjustment	dose for GFR 10–50
Sotalol	80–160 mg bid	normal dose	50% dose	25–50% dose	suppl 80 mg	no adjustment	dose for GFR 10–50
Timolol	10–20 mg bid	normal dose	normal dose	normal dose	no adjustment	no adjustment	dose for GFR 10–50

Drugs	Normal dosage	Dosage adjustment in renal failure			HD	CAPD	CVVH
		GFR > 50	GFR 10–50	GFR < 10			
32.6.4 ***Calcium Channel Blockers***							
Amlodipine	2.5–10 mg qd	normal dose	normal dose	normal dose	no adjustment	no adjustment	dose for GFR 10–50
Diltiazem	30–90 mg tid	normal dose	normal dose	normal dose	no adjustment	no adjustment	dose for GFR 10–50
Felodipine	2.5–20 mg qd	normal dose	normal dose	normal dose	no adjustment	no adjustment	dose for GFR 10–50
Nicardipine	20–30 mg tid	normal dose	normal dose	normal dose	no adjustment	no adjustment	no adjustment
Nifedipine SR	20–40 mg bid	normal dose	normal dose	normal dose	no adjustment	no adjustment	no adjustment
Nimodipine	60 mg q4h	normal dose	normal dose	normal dose	no adjustment	no adjustment	dose for GFR 10–50
Verapamil	40–80 mg tid	normal dose	normal dose	normal dose	no adjustment	no adjustment	dose for GFR 10–50

Drugs	Normal dosage	Dosage adjustment in renal failure			HD	CAPD	CVVH
		GFR > 50	GFR 10–50	GFR < 10			
32.6.5 ***Diuretics***							
Acetazolamide	125–500 mg tid	normal dose	50% dose	avoid	no data	no data	no data
Amiloride	5–10 mg qd	normal dose	normal dose	avoid	avoid	avoid	avoid
Bemetanide	1–4 mg qd	normal dose	normal dose	normal dose	no adjustment	no adjustment	not applicable
Furosemide	20 mg qd–120 mg tid	normal dose	normal dose	normal dose	no adjustment	no adjustment	not applicable
Hydrochlorothiazide	12.5–200 mg qd	normal dose	normal dose	avoid	not applicable	not applicable	not applicable
Indapamide	2.5 mg qd	normal dose	avoid	ineffective	no adjustment	not applicable	no adjustment
Metolazone	2.5 mg qd–10 mg tid	normal dose	normal dose	normal dose	no adjustment	no adjustment	no adjustment
Spironolactone	100–300 mg qd	normal dose	normal dose	avoid	not applicable	not applicable	avoid
Triamterene	25–50 mg bid	normal dose	normal dose	avoid	avoid	avoid	avoid

Drugs	Normal dosage	Dosage adjustment in renal failure			HD	CAPD	CVVH
		GFR > 50	GFR 10–50	GFR < 10			
32.6.6 ***Alpha Blockers***							
Doxazosin	1–16 mg/d	normal dose	normal dose	normal dose	no adjustment	no adjustment	dose for GFR 10–50
Prazosin	1–15 mg/d	normal dose	normal dose	normal dose	no adjustment	no adjustment	dose for GFR 10–50
Terazosin	1–10 mg bid	normal dose	normal dose	normal dose	no adjustment	no adjustment	dose for GFR 10–50
32.6.7 ***Other Antihypertensive Drugs***							
Clonidine	0.1–1.2 mg bid	normal dose	normal dose	normal dose	no adjustment	no adjustment	dose for GFR 10–50
Hydralazine	10–100 mg qid	normal dose	normal dose	normal dose	no adjustment	no adjustment	dose for GFR 10–50
Minoxidil	2.5–10 mg bid	normal dose	normal dose	normal dose	no adjustment	no adjustment	dose for GFR 10–50
Nitroprusside	1–10 mcg/kg/min	normal dose	normal dose	normal dose	no adjustment	no adjustment	dose for GFR 10–50

Drugs	Normal dosage	Dosage adjustment in renal failure			HD	CAPD	CVVH
		GFR > 50	GFR 10–50	GFR < 10			
32.7 Antiarrhythmic Agents							
Amiodarone	200–600 mg/d	normal dose	normal dose	normal dose	no adjustment	no adjustment	dose for GFR 10–50
Disopyramide	150 mg q6h	q8h	q12h	100 mg q24h	no adjustment	no adjustment	dose for GFR 10–50
Digoxin	0.125–0.25 mg qd	normal dose	25–75% dose	25% dose	no adjustment	no adjustment	dose for GFR 10–50
Flecainide	40 mg bid–100 mg tid	normal dose	normal dose	50–75%	no adjustment	no adjustment	dose for GFR 10–50
Lidocaine	1–1.5 mg/kg	normal dose	normal dose	normal dose	no adjustment	no adjustment	dose for GFR 10–50
Magnesium	start 1–2 g IV, then 0.5–1 g/h prn	normal dose	normal dose	max 20 g/48h	no data	no data	no data
Procainamide	0.5–1 g q6h	normal dose	q6–12h	q8–24h	suppl 200 mg	no adjustment	dose for GFR 10–50
Propafenon	150 mg q8h	normal dose	normal dose	normal dose	no adjustment	no adjustment	dose for GFR 10–50
Quinidine ER	300–600 mg q8–12h	normal dose	normal dose	75% dose	suppl 100–200 mg	no adjustment	dose for GFR 10–50

Drugs	Normal dosage	Dosage adjustment in renal failure			HD	CAPD	CVVH
		GFR > 50	GFR 10–50	GFR < 10			
32.8 Oral Hypoglycemic Agents							
Acarbose	25–100 mg tid	normal dose	50% dose	avoid	no data	no data	avoid
Chlorpropamide	100–500 mg q24h	50% dose	avoid	avoid	no data	no adjustment	avoid
Gliclazide	40 mg qd–160 mg bid	50–100% dose	avoid	avoid	no data	no data	avoid
Glipizide	5 mg qd–20 mg bid	normal dose	50% dose	50% dose	no data	no data	avoid
Metformin	500 mg bid–750 mg tid	normal dose	avoid	avoid	no data	no data	avoid
Tolbutamide	0.5–1 g bid	normal dose	normal dose	normal dose	no adjustment	no adjustment	avoid
Pioglitazone	15–45 mg qd	normal dose	normal dose	normal dose	no adjustment	no data	no data
Rosiglitazone	4–8 mg/d, qd to bid	normal dose	normal dose	normal dose	no adjustment	no data	no data
Sitagliptin	100 mg qd	normal dose	25–50 mg qd	25 mg qd	no adjustment	no adjustment	no data

Drugs	Normal dosage	Dosage adjustment in renal failure			HD	CAPD	CVVH
		GFR > 50	GFR 10–50	GFR < 10			
32.9 Lipid-Lowering Agents							
Atorvastatin	10–80 mg qd	normal dose	normal dose	normal dose	no data	no data	no data
Cholestyramine	2–8 mg bid	normal dose	normal dose	normal dose	no data	no data	no data
Clofibrate	500–1000 mg bid	normal dose	normal dose	normal dose	no data	no data	no data
Rosuvastatin	5–20 mg qd	normal dose	max 10 mg for CrCl < 30		no data	no data	no data
Fluvastatin	20–80 mg qd	normal dose	normal dose	normal dose	no data	no data	no data
Gemfibrozil	600 mg bid	normal dose	normal dose	normal dose	no data	no data	no data
Lovastatin	5–20 mg qd	normal dose	normal dose	normal dose	no data	no data	no data
Nicotinic acid	1–2 g tid	normal dose	50% dose	25% dose	no data	no data	no data
Parvastatin	10–80 mg qd	normal dose	normal dose	normal dose	no data	no data	no data
Simvastatin	5–80 mg qd	normal dose	normal dose	normal dose	no data	no data	no data
Ezetimibe	10 mg qd	normal dose	normal dose	normal dose	no data	no data	no data
32.10 Gastrointestinal Agents							
Cimetidine	400–800 mg bid	normal dose	75% dose	25% dose	no adjustment	no adjustment	dose for GFR 10–50
Cisapride	10 mg tid–20 mg qid	normal dose	normal dose	50–75% dose	no data	no data	50–100% dose

Drugs	Normal dosage	Dosage adjustment in renal failure			HD	CAPD	CVVH
		GFR > 50	GFR 10–50	GFR < 10			
Famotidine	20–40 mg bid	normal dose	75% dose	25% dose	no adjustment	no adjustment	dose for GFR 10–50
Lansoprazole	15 mg qd–30 mg bid	normal dose	normal dose	normal dose	no data	no data	no data
Metoclopramide	10 mg tid	normal dose	normal dose	50–75% dose	no adjustment	no data	50–75% dose
Misoprostol	100 mcg bid–200 mcg qid	normal dose	normal dose	normal dose	no data	no data	no data
Omeprazole	20 mg qd–40 mg bid	normal dose	normal dose	normal dose	no data	no data	no data
Rabeprazole	10 mg qd–40 mg bid	normal dose	normal dose	normal dose	no data	no data	no data
Ranitidine	150–300 mg bid	normal dose	75% dose	25% dose	suppl 1/2 dose	no adjustment	dose for GFR 10–50
Pantoprazole	40 mg qd–80 mg bid	normal dose	normal dose	normal dose	no data	no data	no data
Sucralfate	1 g qid	normal dose	normal dose	normal dose	no data	no data	no data

Drugs	Normal dosage	Dosage adjustment in renal failure			HD	CAPD	CVVH
		GFR > 50	GFR 10–50	GFR < 10			
32.11 Neurological Agents/Anticonvulsants							
Carbamazapine	2–8 mg/kg/d	normal dose	normal dose	normal dose	no adjustment	no adjustment	no adjustment
Clonazepam	0.5–2 mg tid	normal dose	normal dose	normal dose	no adjustment	no data	not applicable
Ethosuximide	5 mg/kg/d	normal dose	normal dose	normal dose	no adjustment	no data	no data
Gabapentin	150–900 mg tid	normal dose	50% dose	25% dose	suppl 200–300 mg	300 mg qod	dose for GFR 10–50
Lamotrigine	25–150 mg/d	normal dose	normal dose	normal dose	no data	no data	dose for GFR 10–50
Levetiracetam	500–1500 mg bid	normal dose	50% dose	50% dose	250–500 mg after HD	dose for GFR < 10	dose for GFR 10–50
Phenobarbital	loading 15–20 mg/kg, maintenance 60 mg bid/tid	q8–12h	q8–12h	q12–16h	dose after HD	1/2 normal dose	dose for GFR 10–50
Phenytoin	300–400 mg/d	normal dose	normal dose	normal dose	no adjustment	no adjustment	no adjustment
Primidone	750–1500 mg/d	q8h	q8–12h	q12–24h	suppl 1/3 dose	no data	no data
Sodium valproate	7.5–15 mg/kg/d	normal dose	normal dose	normal dose	no adjustment	no adjustment	no adjustment

Drugs	Normal dosage	Dosage adjustment in renal failure			HD	CAPD	CVVH
		GFR > 50	GFR 10–50	GFR < 10			
Topiramate	50 mg qd–200 mg bid	normal dose	50% dose	avoid	no data	no data	dose for GFR 10–50
Trimethadione	300–600 mg tid/qid	q8h	q8–12h	q12–24h	no data	no data	dose for GFR 10–50
Vigabatrin	1–2 g bid	normal dose	50% dose	25% dose	no data	no data	dose for GFR 10–50
Carbidopa/Levodopa	1 tablet tid to 6 tablets qd (according to preparation)	normal dose	normal dose	50–100% dose	no adjustment	50–100% dose	dose for GFR 10–50
Selegiline	1.25–2.5 mg qd	normal dose	normal dose	normal dose	no data	no data	no data
32.12 Arthritis and Gout							
Allopurinol	300 mg qd	75% dose	50% dose	25% dose	1/2 dose after HD	no data	dose for GFR 10–50
Auranofin	6 mg qd	50% dose	avoid	avoid	no adjustment	no adjustment	no adjustment
Colchicine	Acute: 0.5 mg q6h Chronic: 0.5–1 mg qd	normal dose	50% dose	25% dose	no adjustment	no data	dose for GFR 10–50

Drugs	Normal dosage	Dosage adjustment in renal failure			HD	CAPD	CVVH
		GFR > 50	GFR 10–50	GFR < 10			
Gold sodium	25–50 mg/wk	50% dose	avoid	avoid	no adjustment	no adjustment	avoid
Penicillamine	250–1000 mg qd	normal dose	avoid	avoid	suppl 1/3 dose	no data	dose for GFR 10–50
Probenecid	500 mg bid	normal dose	avoid	avoid	avoid	no data	avoid
Sulfasalazine	1–2 g/d, bid to qid	normal dose	q12h	q24h	no data	no data	no data
Methotrexate	7.5–25 mg qwk	75% dose	25–50% dose	avoid	suppl 50% dose	no adjustment	50% dose
32.13 NSAIDs[b]							
Diclofenac	25–75 mg bid	normal dose	normal dose	normal dose	no adjustment	no adjustment	dose for GFR 10–50
Ibuprofen	300–800 mg tid	normal dose	normal dose	normal dose	no adjustment	no adjustment	dose for GFR 10–50
Indomethacin	25–50 mg tid	normal dose	normal dose	normal dose	no adjustment	no adjustment	dose for GFR 10–50
Ketoprofen	25–75 mg tid	normal dose	normal dose	normal dose	no adjustment	no adjustment	dose for GFR 10–50
Mefanamic acid	250 mg qid	normal dose	normal dose	normal dose	no adjustment	no adjustment	dose for GFR 10–50

Drugs	Normal dosage	Dosage adjustment in renal failure			HD	CAPD	CVVH
		GFR > 50	GFR 10–50	GFR < 10			
Naproxen	500 mg bid	normal dose	normal dose	normal dose	no adjustment	no adjustment	dose for GFR 10–50
Piroxicam	20 mg qd	normal dose	normal dose	normal dose	no adjustment	no adjustment	dose for GFR 10–50
Sulindac	200 mg bid	normal dose	normal dose	normal dose	no adjustment	no adjustment	dose for GFR 10–50
32.14 Sedatives							
32.14.1 *Barbiturates*							
Pentobarbital	30 mg q6–8h	normal dose	normal dose	normal dose	no adjustment	no adjustment	dose for GFR 10–50
Phenobarbital	50–100 mg q8–12h	q8–12h	q8–12h	q12–16h	dose after HD	1/2 normal dose	dose for GFR 10–50
Thiopental	individualized	normal dose	normal dose	normal dose	no data	no data	no data

Drugs	Normal dosage	Dosage adjustment in renal failure			HD	CAPD	CVVH
		GFR > 50	GFR 10–50	GFR < 10			
32.14.2 ***Benzodiazepines***							
Alprazolam	0.25–0.5 mg q8h	normal dose	normal dose	normal dose	no adjustment	no data	no data
Clorazepate	15–60 mg q24h	normal dose	normal dose	normal dose	no data	no data	no data
Chlordiazepoxide	5–25 mg tid–qid	normal dose	normal dose	50% dose	no adjustment	no data	dose for GFR 10–50
Clonazepam	0.5 mg tid	normal dose	normal dose	normal dose	no adjustment	no data	no data
Diazepam	2–10 mg tid–qid	normal dose	normal dose	normal dose	no adjustment	no data	no adjustment
Lorazepam	1–2 mg q8–12h	normal dose	normal dose	normal dose	no adjustment	no data	dose for GFR 10–50
Midazolam	individualized	normal dose	normal dose	50% dose	no data	no data	no data
Temazepam	7.5–30 mg bedtime	normal dose	normal dose	normal dose	no adjustment	no adjustment	no data
Triazolam	0.25–0.5 mg bedtime	normal dose	normal dose	normal dose	no adjustment	no adjustment	no data
32.14.3 ***Benzodiazepine Antagonist***							
Flumazenil	0.2 mg IV	normal dose	normal dose	normal dose	no adjustment	no data	no data

Drugs	Normal dosage	Dosage adjustment in renal failure			HD	CAPD	CVVH
		GFR > 50	GFR 10–50	GFR < 10			
32.14.4 *Lithium*							
Lithium	300 mg tid–qid	normal dose	50–75% dose	25–50% dose	dose after HD	no adjustment	dose for GFR 10–50
32.15 Antipsychotics							
Chlorpromazine	300–800 mg/d	normal dose	normal dose	normal dose	no adjustment	no adjustment	dose for GFR 10–50
Clozapine	300–450 mg/d	normal dose	normal dose	normal dose	no data	no data	no data
Haloperidol	0.5–5 mg bid/tid	normal dose	normal dose	normal dose	no adjustment	no adjustment	dose for GFR 10–50
Olanzapine	5–10 mg qd	normal dose	normal dose	normal dose	no adjustment	no data	no data
Promethazine	20–100 mg/d	normal dose	normal dose	normal dose	no data	no data	dose for GFR 10–50
Quetiapine	150–750 mg/d	normal dose	normal dose	normal dose	no data	no data	no data
Risperidone	1–3 mg bid		start at lower dose		no data	no data	no data
Thioridazine	50–100 mg tid	normal dose	normal dose	normal dose	no adjustment	no data	no data
Trifluoperazine	1–2 mg bid	normal dose	normal dose	normal dose	no adjustment	no data	no data

Drugs	Normal dosage	Dosage adjustment in renal failure			HD	CAPD	CVVH
		GFR > 50	GFR 10–50	GFR < 10			
32.16 Antidepressants							
Citalopram	20–60 mg qd	normal dose	normal dose	avoid	no data	no data	no data
Escitalopram	10 mg qd	normal dose	normal dose	use with caution	no data	no data	no data
Fluoxetine	20–60 mg qd	normal dose	normal dose	normal dose	no adjustment	no adjustment	no data
Mirtazapine	15–45 mg bedtime	normal dose	70% clearance	50% clearance	no data	no data	no data
Paroxetine	20–50 mg qd	normal dose	50% dose	25% dose	no data	no data	no data
Sertraline	50–200 mg qd	normal dose	normal dose	normal dose	no adjustment	no data	no data
Venlafaxine	37.5–75 mg bid to tid	75% dose	75% dose	50% dose	dose after HD	no data	no data
32.17 Anticoagulants							
Alteplase	60 mg over 1 h, then 20 mg/h for 2 h	normal dose in renal failure			no data	no data	dose for GFR 10–50
Aspirin	80–300 mg/d	normal dose	normal dose	normal dose	dose after HD	no adjustment	dose for GFR 10–50
Clopidogrel	75 mg qd	normal dose	normal dose	normal dose	no data	no data	no data
Nadroparin	171 IU/kg/d	normal dose	dosage reduction recommended		no data	no data	no data
Dipyridamole	50 mg tid	normal dose	normal dose	normal dose	no data	no data	no data
Enoxaparin	1 mg/kg q12h	normal dose	75–50% dose	50% dose	no data	no data	no data
Heparin	75 mg/kg loading, then 15 mg/kg/h	normal dose in renal failure			no adjustment	no adjustment	dose for GFR 10–50
Streptokinase	1.5 MU over 1 h	normal dose	normal dose	normal dose	no data	no data	dose for GFR 10–50
Ticlopidine	250 mg bid	normal dose	normal dose	normal dose	no data	no data	dose for GFR 10–50
Urokinase	4400 U/kg/h × 12 h	no data	no data	no data	no data	no data	no data
Warfarin	adjust with INR	normal dose	normal dose	normal dose	no adjustment	no adjustment	no data
32.18 Antihemophilic Agent							
Tranexamic acid	25 mg/kg/dose tid to qid	50% dose	25% dose	10% dose	no data	no data	no data

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A case of fluoxetine-induced syndrome of inappropriate antidiuretic hormone secretion.

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Abstract

BACKGROUND: A 58-year-old schizophrenic male who had been drinking at least 4-5 l of pure water every day for 30 years was admitted to a hospital with complaints of nausea, fatigue, and irregular, fluctuating fevers (up to 39 degrees C). He had previously been prescribed fluoxetine at a dose of 20 mg/day and had been using the drug for 28 days.

INVESTIGATIONS: Review of medical history, physical examination, blood analysis, urine analysis, chest radiography and abdominal ultrasound.

DIAGNOSIS: Psychogenic polydipsia and fluoxetine-induced syndrome of inappropriate antidiuretic hormone secretion.

MANAGEMENT: Fluid restriction and discontinuation of fluoxetine.

PMID: 18317501 [PubMed - indexed for MEDLINE]

Drugs	Normal dosage	Dosage adjustment in renal failure			HD	CAPD	CVVH
		GFR > 50	GFR 10–50	GFR < 10			
32.19 Chemotherapy							
Bleomycin	individual protocol	normal dose	45–70% dose	40% dose	no adjustment	no data	75% dose
Busulfan	individual protocol	normal dose	normal dose	normal dose	no data	no data	no data
Capecitabine	individual protocol	normal dose	75% dose	CrCl < 30 contraindicated	no data	no data	no data
Chlorambucil	individual protocol	normal dose	75% dose	50% dose	no data	50% dose	no data
Cyclophosphamide	individual protocol	normal dose	normal dose	75% dose	50% dose after HD	75% dose	100% dose
Cytarabine	low dose (100–200 mg/m^2)	no adjustment	no adjustment	no adjustment	no data	no data	no data
	high dose (1–3 g/m^2)	60% dose	50% dose	avoid use if CrCl < 30	avoid	avoid	no data
Doxorubicin	individual protocol	normal dose	normal dose	normal dose	no adjustment	no data	no data

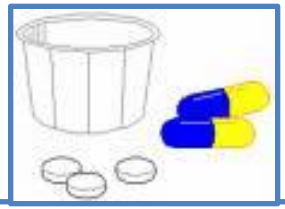
Drugs	Normal dosage	Dosage adjustment in renal failure			HD	CAPD	CVVH
		GFR > 50	GFR 10–50	GFR < 10			
Etoposide	individual protocol	normal dose	75% dose	50% dose	no adjustment	no adjustment	75% dose
Fluorouracil	individual protocol	normal dose	normal dose	normal dose	suppl 50% dose	no data	no data
Imatinib	400–800 mg qd	no data, urinary excretion: 5% intact drug			no data	no data	no data
Melphalan	individual protocol	normal dose	75% dose	50% dose	dose after HD	50% dose	75% dose
Mitomycin	individual protocol	Cr > 1.7 mg/dL (150 µmol/L) contraindicated			no data	no data	no data
Thalidomide	100–400 mg qd	no data, urinary excretion: <1% intact drug			no data	no data	no data
Tretinoin	45 mg/m^2/d bid–tid	no data, urinary excretion: 63%			no data	no data	no data
Vinblastine	0.1–0.5 mg/kg/wk	normal dose	normal dose	normal dose	no data	no data	no data
Vincristine	individual protocol	normal dose	normal dose	normal dose	no data	no data	no data
32.20 Iron-Chelating Agent							
Deferoxamine	20–40 mg/kg/d over 8 h	normal dose	normal dose	50% dose	no data	no data	no data

Drugs	Normal dosage	Dosage adjustment in renal failure			HD	CAPD	CVVH
		GFR > 50	GFR 10–50	GFR < 10			
32.21 Immunosuppressants							
Azathioprine	1–3 mg/kg/d	normal dose	75% dose	50% dose	suppl 0.25 mg/kg	no adjustment	no data
Cyclosporin	7–9 mg/kg/d bid (tapered down to achieve desirable drug level)	normal dose	normal dose	normal dose	no adjustment	no adjustment	normal dose
Sirolimus	loading 4–6 mg/d, maintenance 1–2 mg/d, adjust according to drug level	normal dose	normal dose	normal dose	no adjustment	no adjustment	no data
Everolimus	0.75 mg bid	normal dose	normal dose	normal dose	no adjustment	suggested	no data
Tacrolimus	0.075–0.2 mg/kg/d	lowest dose of recommended range			no adjustment	no adjustment	no data
Mycophenolic acid	720 mg bid	normal dose	normal dose	normal dose	no adjustment	no adjustment	no data
Mycophenolic mofetil	1 g bid	normal dose	normal dose	normal dose	no adjustment	no adjustment	no data

BÖBREK FONKSİYON BOZUKLUĞUNDA AKILCI İLAÇ KULLANIMINA YAKLAŞIM

1. Hikaye ve fizik muayene

- Hastanın volüm durumu??
- Ödem?, asit?, dehidratasyon?
- Boy? Kilo?
- KC yetersizliği bulguları?



2. Karaciğer metabolizmasından emin ol

3. Böbrek fonksiyonunu belirle

- kreatinin klirensi

4. Yükleme dozunu ve idame dozu belirle

- Yükleme dozu olmazsa, terapötik kan düzeyine ulaşma için 3-4 yarı ömür kadar süre geçmesi gerekir!
- Normovolemik KBY'lilerde yükleme dozu, renal fonksiyonları normal olan kişilerle benzer olmalıdır

5. İlaç etkileşimlerini kontrol et

6. Kan düzeyi takibine karar ver

Teşekkürler…