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Title Page

Consolidating Human Disease Learning in the Dental Emergency Clinic

Short title:

Human Disease in the Dental Emergency Clinic

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Title:

Consolidating Human Disease Learning in the Dental Emergency Clinic

Abstract

Introduction:

Dental undergraduates typically learn and are assessed on aspects of human disease (HD) in the early part of their programme, but it is not until later in the programme that their HD knowledge is put into practice when they provide courses of treatment for numerous patients over multiple visits. The teaching of HD provides core knowledge on medical conditions & medications and is therefore essential in allowing newly graduated dentists to provide safe treatment for medically-compromised patients or those taking medications. We wanted to examine the medical complexity of patients attending a university hospital dental emergency clinic to determine whether this was a suitable group that would help students to consolidate their HD learning in the context of a single visit where treatment was also provided.

Materials and methods:

We examined the medical history of 200 patients attending the dental emergency clinic in the University Dental Hospital, Cardiff using a previous study as a benchmark. Anonymous data was collected using the medical history proforma, and included age, gender, medications, types and number of medical conditions/disorders.

Results:

Patients attending the clinic were more medically complex that those in the comparator study and the demographics reflect wider population data showing increasing numbers of older patients with greater medical morbidity.

Discussion/Conclusions:

The emergency dental clinic is the place where most patients are new to the hospital, have a dental history, medical history, investigations, diagnosis and treatment in a single visit, and offers excellent opportunities for consolidating HD learning in a one-stop clinical treatment episode, guided by suitable instructors.

Key words: Medically-compromised, dental undergraduate, human disease, chairside learning

Data availability statement: The data that support the findings of this study are available from the corresponding author upon reasonable request

Conflict of Interest/Disclosure Statement: The authors have no conflicts of interest to declare

Main Text:

Introduction

Human disease (HD) teaching and learning (also known as Clinical Medical Sciences for Dentistry – CMSD) is the core knowledge that allows newly graduated dentists to practice safely, whilst minimising possible harm to their patients (e.g.: drug interactions with prescribed medications, or post-extraction bleeding for patients on anticoagulants). Most UK and Ireland undergraduate dental courses include HD teaching blocks in the early-to-mid years of a typical five-year degree,[1] and often before the students begin the majority of their patient interactions. According to Miller's 'Framework for clinical assessment'[2] we want to progress the dental student who 'knows' (has knowledge) through the 'knows how' (competence) and the 'shows how' (performance) to the 'does' (action) stage of safe dental practice.

During a 5-year undergraduate dental programme, a dental student will typically carry out more clinical dental activity as the years progress, with a more holistic approach to treatment and a greater number of patients being looked-after in the later years. Dental students will in effect be running a mini dental practice and look after their patients over courses of treatment that may take numerous appointments and last many months, meaning the same patient is seen numerous times. Because of this, there may be fewer opportunities to see a larger number and breadth/variety of patients, and therefore a reduced opportunity to develop new-history-taking skills, including medical histories, and making treatment plans that account for differing degrees of medical complexity. Each dental student will be familiar with the medical histories of the handful of patients they provide treatment for, but this could be a cohort with no or few medical conditions.

Nearly all dental undergraduates will have experience of seeing patients attending dental emergency clinics, but unlike their usual aforementioned patient cohort, these patients will have a history, clinical examination, special tests, diagnosis, and treatment if required, all on the same, single visit. In this regard, any complexities in the medical or drug history need to be instantly understood by the dental student, as they are immediately relevant in treatment planning, be it for a temporary restoration to alleviate pain, or for a dental extraction to achieve the same aim, as well as for dealing with a medical emergency, should one arise. It is at this point that all the learning in the HD programme becomes pertinent to provide safe treatment for the patient, and so the dental emergency clinic is the ideal environment for dental students to consolidate their HD learning and help them progress along Miller's Framework.[2]

The prevalence of multimorbidity in the general population is increasing, partly due to people living longer.[3] Alongside this, the ageing population are retaining more of their natural dentition, meaning there is an increase in comorbid patients accessing dental care in community clinics and high-street practices.[4] With this in mind, we wished to examine the levels of medical complexity and comorbidity of patients attending an emergency clinic in a university dental hospital, and highlight how this experience helps consolidate HD learning, preparing dental students to be safe beginners in dental practice.

Method

A number of studies looking at medical histories in dental patients have been carried out around the world and have been reported in the medical literature.[4,5,6,7,8,9] Among these studies, a paper in a UK dental hospital and school most closely mirrored our proposed study and was used as a benchmark for this service review.[10]

Following appropriate clinical governance approval, anonymised patient data was collected. The medical history proformas of 200 new (first-visit) patients attending the emergency clinic at the University Dental Hospital, Cardiff in January 2020 were retrospectively analysed. Exclusion criteria were anyone under the age of 18 years, review patients, hospital inpatients, and those referred for dental screening prior to cardiac surgery and organ or bone marrow transplant procedures, (because of their likely inherent and exaggerated medical complexity). The review therefore focussed on the more generalisable cohort of patients referred to the dental hospital through the local health board dental emergency hub; a telephone helpline for people with dental problems who are not registered with a dentist, and so are unable to otherwise access NHS urgent dental care.

Using a data collection form modelled on the generic medical history proforma in the dental hospital records we collected anonymous basic demographic information such as age and gender, and specific information about the number and type of medical conditions for each patient, as well as the number and type of prescription medications being taken by that patient.

Results

The age range of patients attending the clinic was 18 to 83 years, with a slight preponderance of males in the sample (figure 1 & figure 2). The majority of the patients in this study (57.5%, n= 115) were aged 18-35 years. Cardiff is home to a number of universities and colleges, so as well as the native population, there is a large proportion of younger adults who are resident only for their educational years.

As expected, in the sample population younger patients were healthier and had fewer medications and disorders than older patients, reflecting the general population. However, even with an overall younger sample population, as the patients' age increases, so does the number of medications and co-existing medical disorders. Figure 3 demonstrates that the patients with the higher number of medications were also in the older age groups. Similarly, figure 4 demonstrates that the patients with the most comorbidities were in the older age groups.

Figure 5 shows the most common medical conditions of the 200 patients, whilst figure 6 shows the twenty most common medications being taken by these patients.

51 psychiatric diagnoses were recorded across 44 patients, most commonly depression (n=29) and anxiety (n=12). Other psychiatric conditions included post-traumatic stress disorder, insomnia and schizophrenia. The high number of antidepressant medications recorded (figure 6) likely reflects the drug management of depressive disorders; 27 of the 29 patients with depression took an antidepressant medication. Sertraline and citalopram made up the majority of medication for depression. Tricyclic antidepressants such as amitriptyline and dosulepin, and selective noradrenaline reuptake inhibitor (SNRI) antidepressants such as duloxetine are also commonly used for the management of neuropathic pain, which is becoming increasingly common in diabetic neuropathy as the population of patients with type 2 diabetes increases, reflected by the number of hypoglycaemic medications and insulin recorded in this patient cohort (figure 6).

19% of patients (n=38) had an allergic condition recorded, including drug allergies to penicillin (n=12), and other substances of relevance to dentistry including codeine (n=2), ibuprofen, erythromycin, metronidazole, plasters and tranexamic acid. Six patients reported hayfever, and all these were taking an anti-histamine.

54 cardiovascular conditions were recorded across 34 patients. Hypertension was the most common cardiovascular diagnosis (n=23), followed by hypercholesterolaemia (n=12). Reflecting the high number of patients with hypertension, antihypertensives were overall the second most common medication recorded (figure 6). 100% of patients with hypertension were medicated with at least one antihypertensive medication, most commonly amlodipine (n=11).

17% of patients (n=34) reported a gastrointestinal condition, most commonly gastro-oesophageal reflux (n=18), and irritable bowel syndrome (n=4). The most common medication recorded for GI conditions was a proton pump inhibitor (n=17), comprising omeprazole, lansoprazole and esomeprazole. PPIs were the 5th most common medication recorded (figure 6), reflecting the treatment of gastro-oesophageal reflux, as well as to mitigate the gastro-irritant effects of non-steroidal anti-inflammatory drugs (NSAIDs) and oral steroids, which were also among the more common medications being taken (figure 6).

27 patients reported respiratory conditions - 18 had asthma and 5 reported chronic obstructive pulmonary disease. In line with this, bronchodilators were commonly recorded (figure 6), being used by 23 patients, 20 of whom used salbutamol. Steroid use was also attributed to some patients with respiratory disease.

The next most common medical condition was an endocrine disorder. 11 patients had type 2 diabetes mellitus, 4 had type 1 diabetes mellitus, and the remaining 3 patients reported thyroid disease.

17 patients (8.5%) had a musculoskeletal medical problem, including osteoporosis, slipped vertebral discs and osteoarthritis. 14 patients had a blood disorder, most commonly anaemia. 2 patients had acute myeloid leukaemia. 12 patients reported skin conditions, 58% of which were eczema (n=7). 10 patients reported infections, comprising bacterial infections, fungal infections, and having human immunodeficiency virus (HIV). 8 patients reported nervous system problems, including epilepsy, neuropathy and multiple sclerosis. 4 patients reported renal problems, comprising malignancy, renal failure, dialysis, and renal transplant.

Discussion

The results of this study show that patients presenting to an emergency department at a university dental hospital have a range of medical conditions and drugs reflective of the general population.

As a location for hands-on, practical consolidation of HD teaching, there is probably no better place in a dental hospital and school than the dental emergency clinic. The enhanced learning through repetition of medical history taking, and the opportunities for reflection and discussion of relevant aspects of the patient's medical history with peers and supervisors whilst a patient is away from the dental chair having a radiograph taken, or afterwards, are unparalleled. This may be formalised into a HD-linked reflective portfolio as part of formative or summative assessment, as suggested by Anderson and colleagues.[11] Reflections by students have been shown to be effective as part of learning,[12,13] and the dental emergency clinic should be no exception. Multimorbidity is increasing in our dental patient population,[3,4,14] and dental students need to be prepared to care for the full spectrum of patients presenting in their current and future practice. Although the majority of patients

presenting to the emergency department were younger (18-35 years), representing the demographic of a university town, several of these younger patients still had polypharmacy and multiple medical conditions (figures 3 & 4). Furthermore, students do not get choice in which patients they see on the emergency department (first come first serve basis) and therefore this is important to ensure students do get exposure to older patients who are more likely to have more complex medical histories, as it is well established that some students will actively avoid complex patients due to difficulty and fear of failure. As well as this, for those graduates who may move into dental specialty areas such as special care dentistry or oral medicine, a solid understanding of human health and disease and its relation to dental treatment is key.[15] There is an increasing appreciation of the interplay between oral health and general health,[16] though it is possible that the links regarding causation, as opposed to association, may be overstated.[17] Nonetheless, the dental emergency clinic presents another learning opportunity relating general health and management of patients with dental disease.

Apart from the benefits to consolidating learning in HD, the dental emergency clinic is obviously a teaching resource for dental undergraduates who, on qualifying, are expected to manage the urgent care of patients with acute dental problems. The General Dental Council states in 'Preparing for Practice' that it requires evidence of undergraduate students being able to treat 'acute oral conditions',[18] as well as to 'identify, explain and manage the impact of medical and psychological conditions in the patient', both of which apply to the dental emergency clinic. A similar paper describing areas of competence and learning outcomes of the graduating European dentist focusing on patient-centred care includes, 'consider the implications of systemic disease and polypharmacy', and 'manage dental emergencies of the primary and permanent dentition including those of pulpal, periodontal or traumatic origin', which may be neatly combined when working in the dental emergency clinic.[19] The utilisation and benefit of the emergency clinics to students has been discussed elsewhere,[20,21] including the use of a reflective portfolio.[22] The validity and utility of a reflective portfolio in clinical undergraduate education has also been examined,[23] and should be applicable to the consolidation of student HD learning in the dental emergency clinic.

The scenarios described above rely on teaching opportunities presenting in the clinic, and for the students' supervisor to recognise the opportunity presented and take advantage of it for some impromptu chairside teaching (known as bedside teaching in medicine). Bedside teaching in medicine as an educational tool has been explored and has a long history, being described in relation to medical education in 1892 by Sir William Osler, who said "*Medicine is learned at the bedside and not in the classroom*".[24]

Bedside teaching has a number of positives – it is well understood to improve understanding, confidence and communication skills,[25] it has the potential to be one of the most effective modalities in medical education,[26,27] and it can provide all the key elements known to be associated with effectual deep learning. It can be interactive, relevant, targeted, timely and encourage critical thinking skills.[28] In medicine, bedside teaching is well established in the emergency department,[29] analogous to the teaching in the dental emergency clinic described herein.

In dentistry, chairside teaching and learning has been evaluated. In relation to stakeholders, including students, they report "*It's really important to have a chance to think about what we have been taught and draw on it, learn from it. You need to think about what you know and how you are going to use that knowledge."* In relation to debriefing (reflection), they report "*having an opportunity to debrief after a clinic is really useful, you can talk about what you have learned, what went well…".*[30] And in relation to dental teachers it was noted that one aspect of good chairside teaching was to "*Ensure good feedback to students – which ideally should be immediate*" and "*it should encourage reflective practice"*.[31]

Conclusion

This study confirms that those patients attending a university dental hospital emergency clinic present with a range of medical conditions and the drugs with which these conditions are managed. Older patients especially, take multiple medications and often have a number of comorbidities, and patients may present with acute dental conditions including trauma, infection and pain, and so may need immediate pain-relieving dental treatment, or dental extraction, often combined with prescription of pain-relieving medications or antibiotics. In the situation where the dental undergraduate has to go from a blank page of patient notes, through the dental history, medical history, clinical examination, special investigations, and diagnosis to a treatment plan in one single episode, a thorough knowledge and understanding of the impact of the patient's drugs, diseases and allergies on the proposed treatment and prescribing is immediately relevant. Chairside teaching, and reinforcement of HD learning by instructors, in the context of managing acute dental disease can only help to benefit students and reinforce knowledge and understanding of HD in the clinical situation. Formalising this learning further though the use of portfolios, case studies and reflections may give additional benefit.

A further study is also currently underway on the dental student-led clinic at the university dental hospital, to allow comparison of this data to the medical complexity and comorbidities of patients attending these non-emergency student treatment clinics.

Conflict of Interest/Disclosure Statement

The authors have no conflicts of interest to declare

References

[1] Atkin PA, Thomas S, Cook RJ, et al. Human Disease/Clinical Medical Sciences in Dentistry: Current state and future directions of undergraduate teaching in the UK and Ireland. Eur J Dent Educ. 2018;22(3):e588-e593. doi:10.1111/eje.12356

[2] Miller GE. The assessment of clinical skills/competence/performance. Acad Med. 1990;65(9 Suppl):S63-S67. doi:10.1097/00001888-199009000-00045

[3] Nguyen H, Manolova G, Daskalopoulou C et al. Prevalence of multimorbidity in community settings: A systematic review and meta-analysis of observational studies. J Comorb. 2019 Aug. 2;9:2235042X19870934. doi: 10.1177/2235042X19870934. eCollection Jan-Dec 2019.

[4] Gibson GB, Blasberg B, Hill SJ. A prospective survey of hospital ambulatory dental emergencies. Part 1: Patient and emergency characteristics. Spec Care Dentist Mar-Apr 1993;13(2):61-5. doi: 10.1111/j.1754-4505.1993.tb01456.x.

[5] Humbert A, Schmage P, Harendza S. Internal diseases encountered by dental students while treating dental patients during undergraduate training BMC Med Educ. 2018 Jun 22;18(1):149. doi: 10.1186/s12909-018-1258-3.

[6] Al-Bayaty HF, Murti PR, Naidu RS, et al. Medical problems among dental patients at the school of dentistry, the university of the West Indies J Dent Educ. 2009 Dec;73(12):1408-14.

[7] Walia IS, Bhatia L, Singh A, et al. Prevalence of medical comorbidities in Dental Patients. Annals of International Medical and Dental Research. 2017 Jan-Feb; 3(1): 21-25

[8] Javali MA, Khader MA, Al-Qahtani NA. Prevalence of self-reported medical conditions among dental patients. Saudi J Med Med Sci 2017;5:238-41.

[9] Fernández-Feijoo J, Garea-Gorís R, Fernández-Varela M, et al. Prevalence of systemic diseases among patients requesting dental consultation in the public and private systems. Med Oral Patol Oral Cir Bucal. 2012 Jan 1;17(1):e89-93. doi: 10.4317/medoral.17313.

[10] Patel N, Broadfield LJ, Mellor AC. Medical profile of patients accessing hospital-based emergency dental care. Oral Surgery 7 (2014) 26–32. doi.org/10.1111/ors.12063

[11] Anderson S, Nunn J, Stassen LFA, et al. A survey of dental school's emergency departments in Ireland and the UK: provision of undergraduate teaching and emergency care. Br Dent J. 2015 Jul;218(12):E17. doi: 10.1038/sj.bdj.2015.436. Epub 2015 Jun 12.

[12] Kanthan R, Jenna-Lynn B Senger J-L B, An appraisal of students' awareness of "self-reflection" in a first-year pathology course of undergraduate medical/dental education. BMC Med Educ. 2011 Sep 23;11:67. doi: 10.1186/1472-6920-11-67.

[13] Rogers SL, Priddis LE, Mechels L, et al. Applications of the reflective practice questionnaire in medical education. BMC Med Educ. 2019 Feb 7;19(1):47. doi: 10.1186/s12909-019-1481-6.

[14] Watt RG, Serban S. Multimorbidity: a challenge and opportunity for the dental profession. Br Dent J. 2020 Sep;229(5):282-286. doi: 10.1038/s41415-020-2056-y.

[15] Redford HE, Atkin PA. Dental Students' Attitudes towards understanding of health, disability and disease in dental patients in Wales, UK: a foundation for special care dentistry. Journal of Disability and Oral Health 2017; 18(2): 43-52

[16] Oral Health and General Health. Position Statement – Faculty of Dental Surgery, Royal College of Surgeons of England. April 2019. https://www.rcseng.ac.uk/-/media/files/rcs/fds/media-gov/fds-position-statement--oral-health-and-general-health-final-v4.pdf Accessed March 2021

[17] Raittio E, Farmer J. Methodological Gaps in Studying the Oral-Systemic Disease Connection J Dent Res. 2021 Mar 1;22034520982972. doi: 10.1177/0022034520982972.

[18] Preparing for practice Dental team learning outcomes for registration (2015 revised edition). General Dental Council, London 2015. https://www.gdc-uk.org/docs/default-source/quality-assurance/preparing-for-practice-%28revised-2015%29.pdf Accessed March 2021

[19] Field JC, Kavadella A, Szep S, et al. The Graduating European Dentist-Domain III: Patient-Centred Care Eur J Dent Educ. 2017 Dec;21 Suppl 1:18-24. doi: 10.1111/eje.12310.

[20] Tiwana KK, Hammersmith KJ, Murrah VA. Urgent care in the dental school setting: analysis of current environment and future challenges in emergency dental education. J Dent Educ. 2007 Mar;71(3):331-8.
[21] Carrico CK, Jain S, Brickhouse TH, et al. Utilization of and Dental Students' Perceived Benefits of an Urgent Care Clinic in a Dental School. J Dent Educ. 2020 Jan;84(1):57-61. doi: 10.21815/JDE.019.149.
[22] Anderson S, Nunn J, Stassen LFA, McLoughlin J. A survey of dental school's emergency departments in Ireland and the UK: provision of undergraduate teaching and emergency care. Br Dent J. 2015 Jul;218(12):E17. doi: 10.1038/sj.bdj.2015.436.
[23] Kanthan R, Senger J-LB. An appraisal of students' awareness of "self-reflection" in a first-year pathology course of undergraduate medical/dental education. BMC Med Educ. 2011 Sep 23;11:67. doi: 10.1186/1472-6920-11-67.
[24] Nair BR, Coughlan JL, Hensley MJ. Student and patient perspectives on bedside teaching. Med Educ. 1997;31:341-6.
[25] Gimson A, Javadzadeh S, Doshi A. Bedside teaching: everybody's but nobody's responsibility Adv Med Educ Pract. 2019 May 24;10:357-359. doi: 10.2147/AMEP.S181877.
[26] Garout M, Nuqali A, Alhazmi A, Almoallim H (2016) Bedside teaching: an underutilized tool in medical education. Int J Med Educ 7: 261–262. https://doi.org/10.5116/ijme.5780.bdba
[27] Rojí R, Noguera-Tejedor A, Pikabea-Díaz F, et al. Palliative care bedside teaching: a qualitative analysis of medical students reflective writings after clinical practices. J Palliat Med 2017 20(2): 147–154. https://doi.org/10.1089/jpm.2016.0192
[28] Alcolado J. How to run a bedside teaching session. Br J Hosp Med (Lond). 2018 Feb 2;79(2):C30-C32. doi: 10.12968/hmed.2018.79.2.C30.
[29] Aldeen AZ, Gisondi MA. Bedside teaching in the emergency department. Acad Emerg Med. 2006 Aug;13(8):860-6. doi: 10.1197/j.aem.2006.03.557.
[30] Sweet J, Pugsley L, Wilson J. Stakeholder perceptions of chairside teaching and learning in one UK dental school. Br Dent J. 2008 Nov 8;205(9):499-503. doi: 10.1038/sj.bdj.2008.934.
[31] Sweet J, Wilson J, Pugsley L. Chairside teaching and the perceptions of dental teachers in the UK. Br Dent J. 2008 Nov 22;205(10):565-9. doi: 10.1038/sj.bdj.2008.983.

Figure Legends:

Figure 1: Age of patient sample

Figure 2: Gender split of patient sample

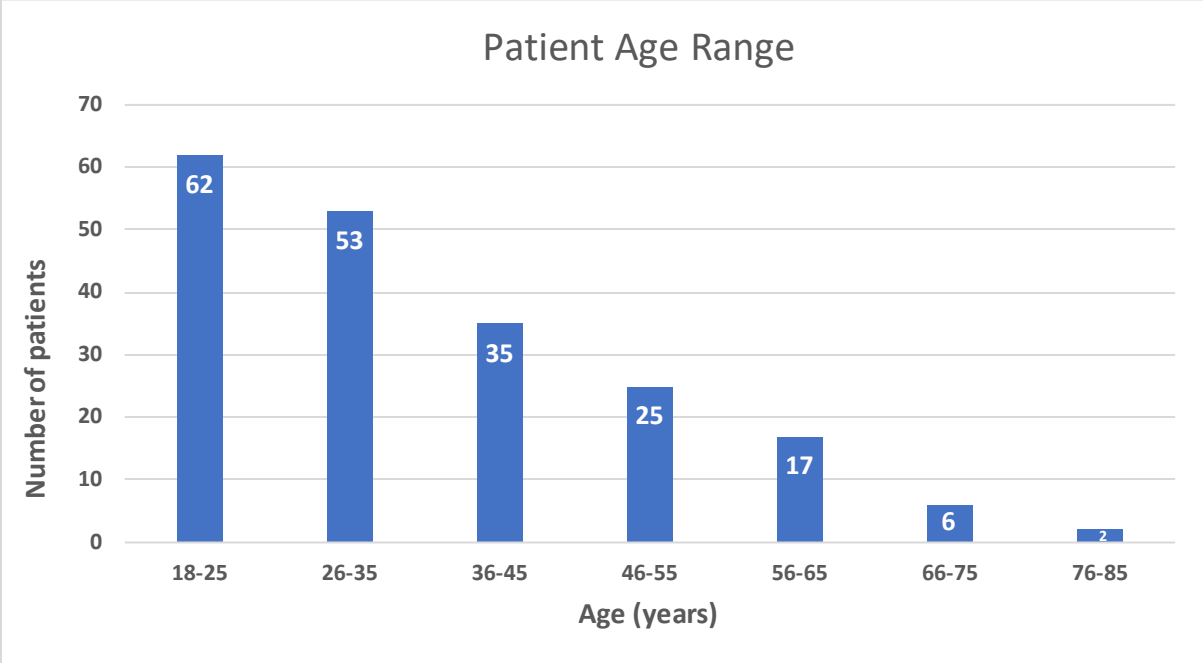
Figure 3: Medication number by patient age group. Older patients have more polypharmacy than younger patients

Figure 4: Average number of medical conditions increases with increasing age

Figure 5: Number of medical conditions recorded for the patient sample

Figure 6: The 20 most common medications being taken by the patient sample

Figures



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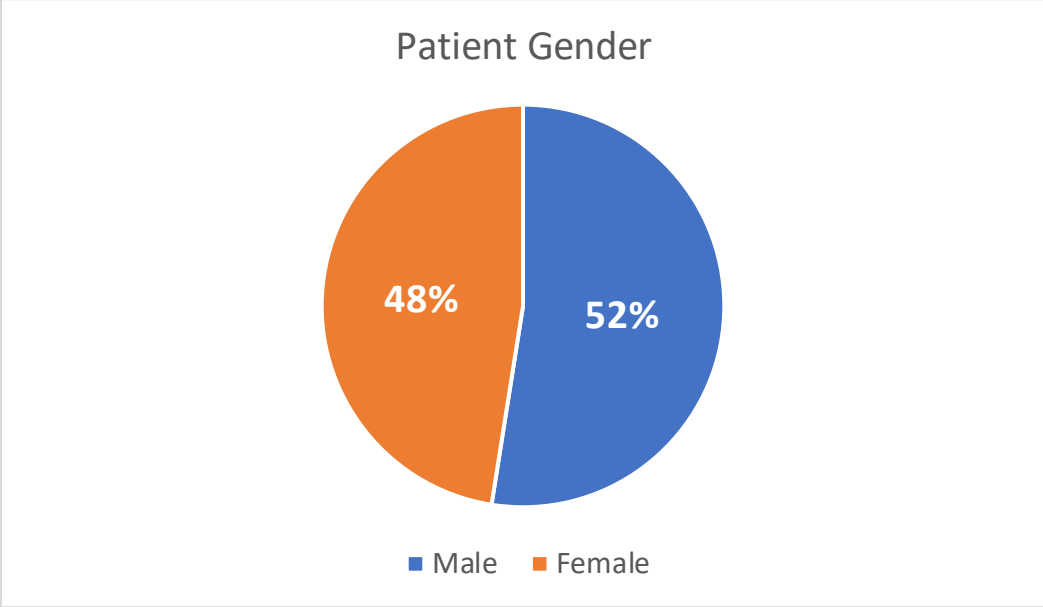
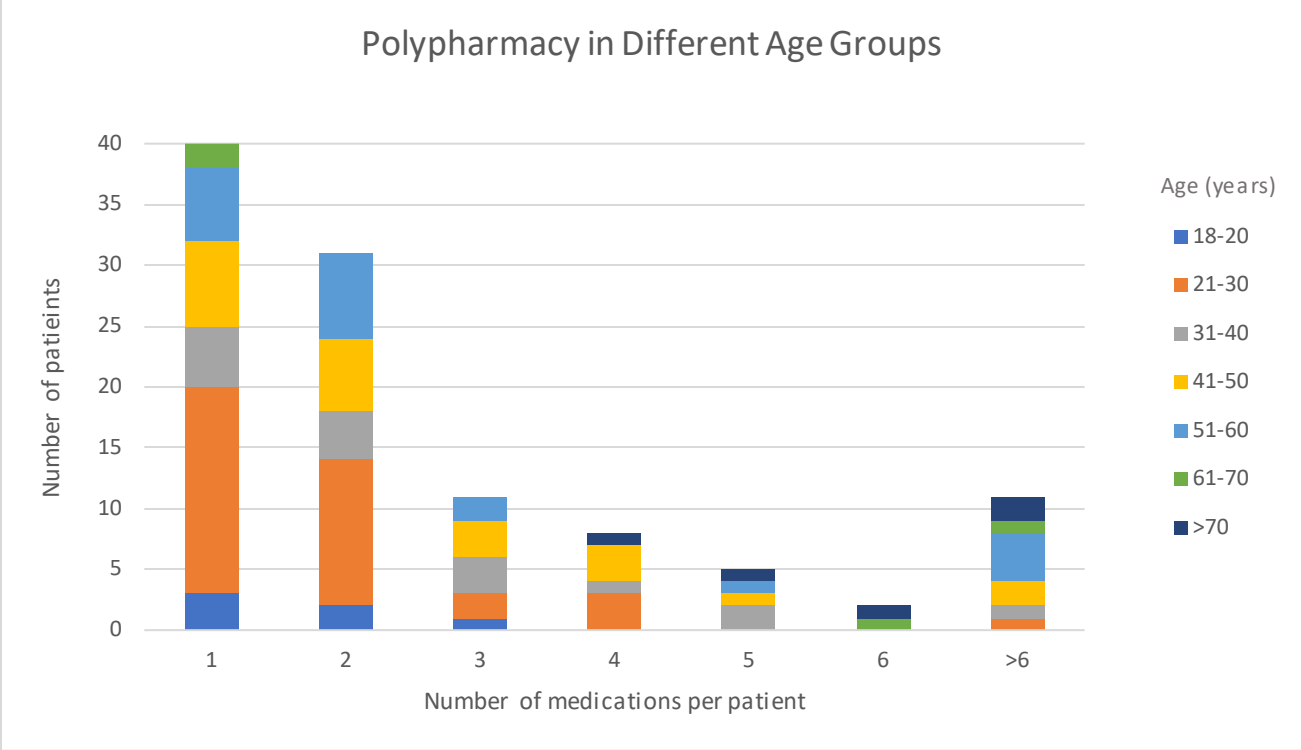


Figure 2: Gender split of patient sample



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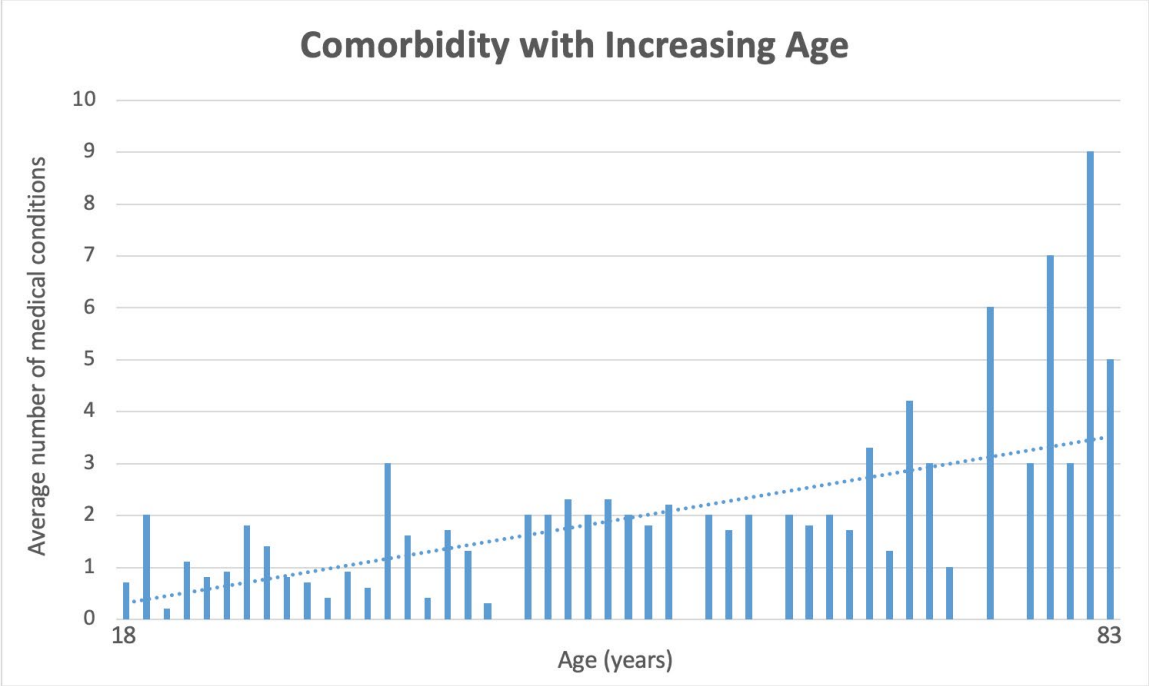
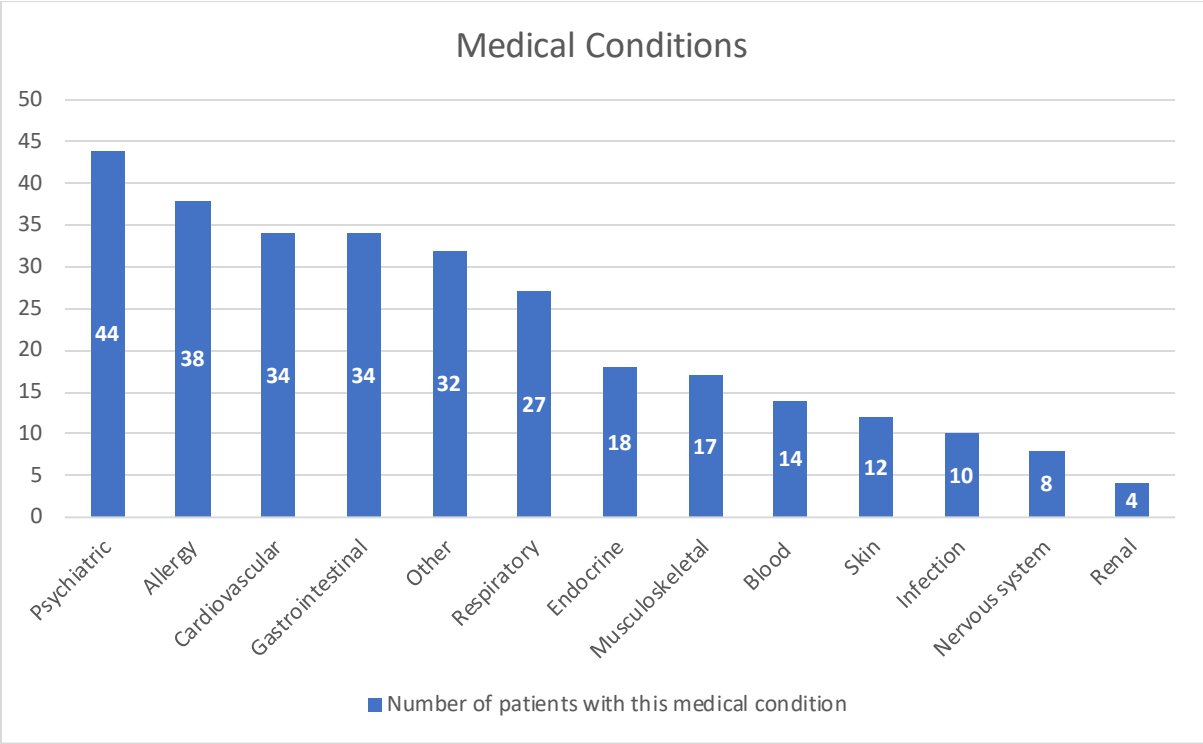


Figure 4: Average number of medical conditions increases with increasing age



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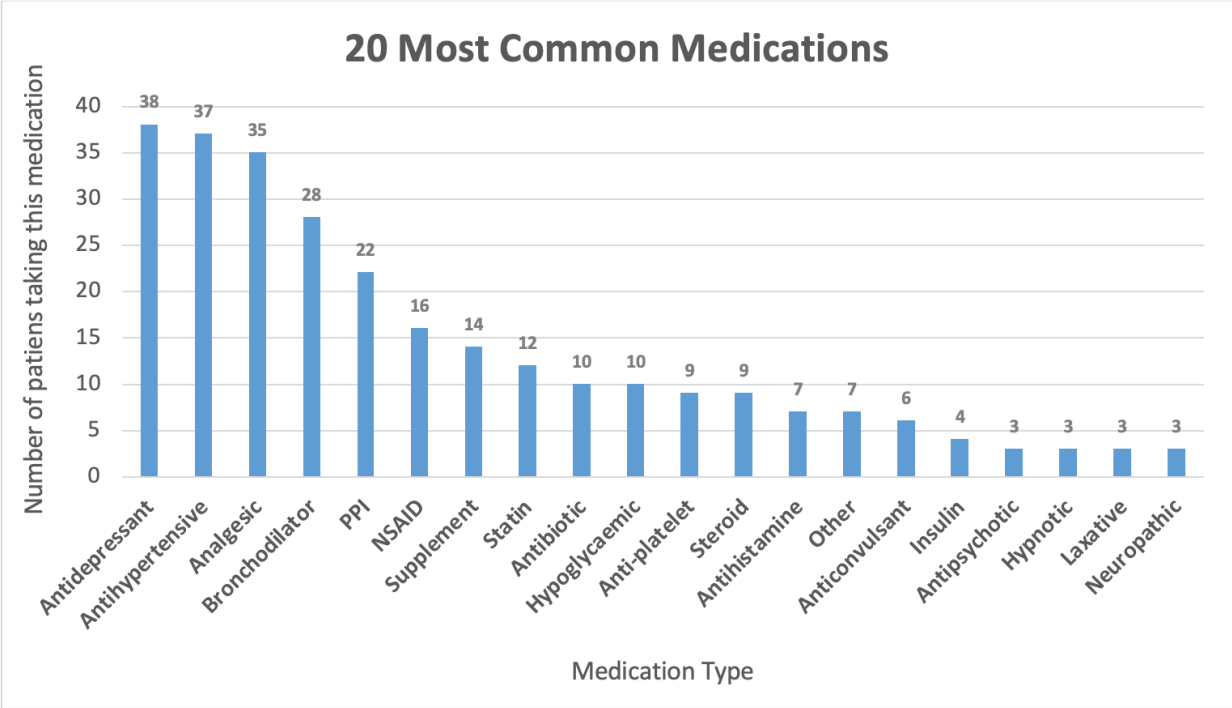

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