INSTITUTO
UNIVERSITÁRIO
DE LISBOA

Patient Centricity-State of The Art

José Paulo Rolim

Master in Business Administration

Supervisor:
PhD Leandro Ferreira Pereira, Associate Professor with Habilitation
ISCTE-IUL

June, 2023

Department of Marketing, Strategy, Operation and General Management

Patient Centricity-State of The Art

José Paulo Rolim

Master in Business Administration

Supervisor:
PhD Leandro Ferreira Pereira, Associate Professor with Habilitation
ISCTE-IUL

June, 2023

Dedication and acknowledgments

A year ago, I started writing my dissertation, and today I am finishing what has been one of the most difficult stages of my life. The journey was difficult and eventful, I found myself struggling daily to achieve the finalization of this work. So, seeing this dissertation finalized gives me great joy and a feeling of duty fulfilled.
I had many ups and downs and the only thing that is guaranteed is that I couldn´t finalize this journey by myself. I have several people to be thankful for: first I would like to thank Dr. Leandro Pereira for all the availability, sympathy, and shared knowledge, it was a pleasure to work with you.

My parents, Fátima and Paulo, are the only people in the world that help me every single day to achieve my goals, they believe in me and have stood right next to me for the last 24 years, without you it was impossible to achieve this milestone in my career.

My grandmothers, Deolinda and Ilda, my second mothers, my best friends, and the persons that I most want to make proud of in this world, you are the love of my life. I will always uphold your legacy.

My grandparents, Valdemar, and Joaquim, for creating the basis of what I still harvest today. My foundations come from my past, and you are mine.

My uncle and godfather Eduardo for all the support during the years, and your unrivaled simplicity that makes him so special. I will always carry what you have taught me.

My brother, João, no matter how opposite we are, we are there for each other in the end.

My friend, João Oliveira for showing me that being alive is the best thing in the world, I wouldn’t be here without you. Thank you for the best years of my life.

To Pedro, Dinis, João, André, Marco, and all my friends that were present in my life during this phase, thank you for all the great memories that I will keep until the end of my life.

Last, I want to thank Carolina, the person that helps me every single day to fight for my goals, pushes me to be better, and makes me a better person capable of doing anything, you have changed everything. Thank you for all the patience and guidance during the last few years, you have changed my present by triggering our future. Remember you are my reason.

Resumo

A medicina baseada no doente pode ser definida como qualquer processo, programa ou decisão centrada nos pacientes e em que os pacientes desempenham um papel ativo como participantes significativamente envolvidos. O objetivo principal é de otimizar a utilização da informação fornecida pelo paciente. Estar centrado no paciente é trabalhar com os pacientes em oposição a trabalhar para eles. Estar centrado no paciente requer um envolvimento significativo com o mesmo para compreender o que é estar no seu lugar e viver diariamente com a sua condição. Não é fácil implementar a medicina baseada no doente nas empresas, especialmente as que têm um modelo de trabalho muito tradicional. A medicina baseada no doente está intimamente relacionada com os cuidados de saúde, incluindo o negócio farmacêutico. Nos últimos anos, as condições de mercado para as empresas farmacêuticas mudaram, e o negócio farmacêutico teve de vir a ser atualizado em função das necessidades e interesses dos clientes. A medicina baseada no doente pode ser a chave para desencadear a mudança e conduzir a uma melhoria. Utilizando um conjunto de dados obtidos através do motor de busca SCOPUS e o programa de análise VOSViewer, o resultado não poderia ser mais claro. Tornar-se centrado no doente é um caminho longo e com muitos obstáculos, mas os benefícios são claros, sendo uma ideologia muito apelativa para as empresas e para toda a cadeia de fornecimento.

Palavras-Chave: Medicina baseada no doente; Medicina; Cuidados de saúde; Humano; Desenvolvimento de fármacos.
JEL: Saúde: Geral (I10), Saúde: Outro (I19)

Abstract

Patient-centricity can be defined as any process, program, or decision centered on patients and in which patients play an active role as meaningfully engaged participants, with the primary goal of optimizing the use of patient-provided information. Being patient-centered is working with patients as opposed to them. Being patient-centered necessitates meaningful engagement with patients to understand what it is like to walk in their shoes and live with their condition daily. Is not easy to implement patient-centricity in companies, especially the ones with a very traditional model of work. Patient-centricity is intimately related to healthcare, in particular the pharmaceutical business. In recent years, the market conditions for pharmaceutical companies have changed, and the pharmaceutical business must be updated to know customers' needs and interests. Patient-centricity can be the key to triggering the change and leading to improvement. The result couldn't be clearer using the SCOPUS dataset and VOSViewer analysis. Becoming patient-centric is a long way goal, with many obstacles, but the benefits are clear, being an ideology that is very appealing to companies and the supply chain.

Keywords: Patient-Centricity; Medicine; Healthcare; Human; Drug Development.
JEL: Health: General (I10), Health: Other (I19)

Index

Dedication and Acknowledgments iii

Resumo v

Abstract vii

Chapter 1. Introduction 1

Chapter 2. Methodology 5

2.1 Data Collection 5

2.2 Data Analysis 5

2.2.1 Patient-Centricity in Business and Management 5

2.2.2 Patient-Centricity - VosViewer Analysis 5

Chapter 3. Literature Review 7

3.1 Patient-Centricity in Business and Management 7

3.1.1 Patient-Centricity in Healthcare 7

3.1.2 Patient-Centricity in Pharma Business 15

3.2 Patient-Centricity – VosViewer Analysis 27

3.2.1 Co-authorship (Authors) 28

3.2.2 Co-authorship (Organizations) 33

3.2.3 Co-authorship (Countries) 34

3.2.4 Co-occurrence (All Keywords) 40

3.2.5 Citations (Documents) 42

3.2.6 Citation (Sources) 58

Chapter 4. Discussions of Results 63

Chapter 5. Conclusions 67

References 68

Glossary

HIV- Human Immunodeficiency Virus

R&D- Research and Discovery

CROs- Sponsors and Contract Research Organizations

ROI- Return on Investment

SC- Supply Chain

KPI- Key Performance Indicator

CRM- Customer Relationship Management

FDA- Food and Drug Administration

PEAC- Patient Engagement Advisory Committee

PROs- Patient-Reported Outcomes

MBFs- Mucoadhesive Buccal Films

OFDs- Orodispersible Films

TPP- Target Product Profile

IRDiRC- International Rare Disease Research Consortium

PCOMs- Patient-Centered Outcome Measures

SmPC- Some of the Products Characteristics

PIL- Product Information Leaflet

MSL- Musculoskeletal

AI- Artificial Intelligence

IHCPT- Integrative Health Coaching Professional Training

IHC- Integrative Health Coaching

PA- Physician Assistant

PHR- Personnel Health Record

NHIN- National Health Information Network

GCP- Good Clinical Practices

EMA- European Medicines Agency

MN- Mobile Nurses

GRAPPA- Group of Research and Assessment of Psoriasis and Psoriatic Arthritis

PRP- Patient Research Partner

CHAPTER 1

Introduction

Nowadays, exist more than 7 billion people on this planet. All of them are humans with needs, health needs, everyone needs medication at some point in their lives, or treatments are needed, medical help, all the world is sustained by healthcare systems, and there are brutal differences in health services from one country to another, but if there's one thing that should be general is a patient-centricity approach for all of them.
Patient-centricity can be defined as any process, program, or decision centered on patients and in which patients play an active role as meaningfully engaged participants, with the primary goal of optimizing the use of patient-provided information. Patient-centered means doing things with patients rather than for them.

Being patient-centered necessitates meaningful engagement with patients to understand what it is like to walk in their shoes and live with their condition daily. It entails determining what is most important to them regarding the effects of a disease and its treatment on their lives. These effects include but are not limited to, health outcomes. They also have symptoms, care partner and family stress, financial burdens, and other factors. When providers understand which impacts patients and families report as most important, care and research can be improved and better meet patient needs, recognizing that what patients report as most important is often different from what clinicians say as most important.

Adopting this ideology and its application in the business world of health is progressive, not immediate. It is a dynamic process that involves not only the patients but also the caregivers, medicals, pharmacists, health professionals, and the entire supply chain.

In all industries, technological and especially healthcare, communication advancements along with the phenomenal growth of data and information have resulted in more educated and empowered consumers. A significant part of adults searches online for health information. Patients can now play a more active role in their healthcare than ever because of social media, patient organizations, health and wellness smartphone apps, wearable fitness equipment, and the quantity of online information. Patients today are

better competent to conduct their research, ask doctors for specific treatments by name, and are more informed, involved, and motivated (Clarityes1, 2020).

Programs and platform designs centered on the patient enhance patient satisfaction and health outcomes. Manufacturers are increasing their emphasis on health outcomes, and practically every company website mentions patient-centricity. Organizations must be fully dedicated to being patient centers to understand the ideal patient health outcome fully. You can't be patient-centric if you can't communicate with patients (Clarityes1, 2020).

The current dissertation will explore and confirm patient-centricity's importance, its benefits, challenges, and improvements. A systematic literature review.

This study aims to conduct a literature review about patient-centricity, from a business management point of view.

This topic is at the center of the health systems, and its use or not is relevant to the efficiency of the health system itself. All pharmaceuticals, hospitals, and health providers should know its importance and relevance. The patient should be the focus, and the implications for the no adoption of this methodology could be a disaster for the health company.

How is the topic organized? What are the areas and subjects highlighted in the literature? What are the most cited authors, articles, and trends? How the issue has evolved during the years, changes that elapsed? What is the contextualization and importance of this topic inside pharmaceutical companies and in business management? Is patient-centricity the future of the health business? Is patient-centricity relevant, if so, why the implementation is necessary, and what are the benefits? There are many challenges to its implementation? These are some questions that this dissertation aims to answer.

The dissertation starts with the methodology where I explain how I collect, evaluate, and analyze the Scopus dataset about patient-centricity. After that, a systematic literature review will be made, starting with a slight notion of the topic in business, especially inside pharmaceutical companies.

The next part of the literature review will be made with the software VOSVIEWER. This software is a tool for the creation of maps based on network data for visualizing and exploring. VOSviewer is intended for analyzing bibliometric networks. In this software, several analysis and counting methods can be combined and are available depending on the type of analysis selected. Using the software VOSviewer, the discussion of results and conclusions will be more easily achieved and interpretable.

CHAPTER 2

Methodology

This study is a literature review. Hence, a big part of the work involves the lecture of articles, books, and other trustworthy sources of information, providing numerous outcomes and ideologies.

The methodology is composed of 2 phases: Data collection, and data analysis.

2.1 – Data Collection

The data collection process aims to create good data for analysis. The Scopus dataset was the bulk of information used for this dissertation. For that, the keywords patient and centricity were used.

The results of Scopus data collection were obtained using the website www.scopus.com through a query as:

TITLE-ABS-KEY (patient and centricity). This query resulted in 574 documents.

2.2 - Data Analysis

In this dissertation, different inputs were analyzed: the patient-centricity in business management, giving the dissertation a literature review start, and the VosViewer analysis using this software's unique bibliographic analysis characteristics.

2.2.1 – Patient-Centricity in Business and Management

For this point, the data collection was obtained using the website www.scopus.com through a query as:

TITLE-ABS-KEY (patient and centricity), limiting the search to Business, Management, and Accounting in the left sidebar in the subject area field, after this a manual selection of the 13 documents were made, selecting the articles more interesting for the topic and the dissertation.

2.2.2 – Patient-Centricity - VosViewer analysis

The program VOSviewer was used to assess the literature citations collected from the dataset utilized for data collection. The program is used to build and display bibliometric

networks. (Eck & Waltman, 2017). VosViewer has different types of analysis possible, and each one of them has unique features and creates special networks. The different types of research are described in the dissertation, more precisely, in chapter 3.2-Patient-Centricity - VosViewer analysis.

VosViewer filtered the 574 documents according to the objectives of the analysis. This bibliographic analyzer turns the literature review lighter and more interpretable. It is important to mention that these 574 documents were obtained on January 10, 2022, and all the data used in this dissertation was extracted on this date.

VosViewer has various options; however, I selected three types of analysis for this dissertation: Co-authorship, co-occurrence, and citation. And six types of unit analysis: Authors, organizations, countries, all keywords, documents, and sources.

CHAPTER 3

Literature Review

3.1 – Patient-Centricity in Business and Management

3.1.1 – Patient-Centricity in Healthcare

In healthcare, the term patient-centricity refers to the emphasis placed on the well-being of each patient, whether undergoing treatment or receiving nursing care. However, this process begins long before the initial contact, not during the medical evaluation. Patient-centricity is the focus of action on patients' desires, expectations, and satisfaction.
This concerns not only doctors and medical assistants at the micro level of medical practice but also parties at other organizational levels (Buske & Medizinio, 2022):

- Macro level: The emphasis on social and political developments and the state of the legal system
- Meso level: Emphasis on associations and institutions

The definition of patient-centricity can have different interpretations. The economic part is more concerned with effective healthcare administration, whereas a patient representative views patient-centricity as promoting autonomy and protecting patient rights. On the other hand, the nurse prioritizes the patient's treatment and care. Since patient happiness, safety, and complaint management are all considered in hospitals, improving quality management is a top concern. But why is patient-centricity so important (Buske & Medizinio, 2022)?

Recognizing patient-centricity as a critical marketing strategy for medical practices is crucial. It directly affects patient acquisition and, therefore, also affects practice turnover. At the same time, an increase in patient-centricity can also lead to more cost- and time-efficient work procedures, which benefits the staff and, in fact, the entire medical practice (Buske & Medizinio, 2022).

Benefits for doctors and psychotherapists	Benefits for employees and teams	Benefits for patients
They can manage their practice confidently and safely care for their patients.	They work structured and fulfill their tasks with a routine and great confidence.	They benefit from coordinated and safe processes and a stress-free atmosphere in practice.
Their structured practice means a less hectic and stressful pace.	They know what you are responsible for and what everyone else is responsible for.	They will be informed about everything that is important at registration as well as in the consulting room.
The working atmosphere is good; conflicts can be solved (more quickly).	They talk openly about mistakes and problems and look for solutions together.	They feel well treated and securely advised.
They have more time and calm for their patients.	They offer each other relief at work because not everyone (has to) do everything.	Their doctor or psychotherapist has more time for them thanks to an efficient practice setup.
They can plan and use resources better.	They support each other and can jump in for one another.	They can address problems. Their complaints are taken seriously.
They are relieved of tasks that employees can take over.	Clear rules and transparent structures contribute to a good working atmosphere.	They can be sure that their data and information will be treated confidentially.
They can avoid errors and avoid liability-related risks.	They take the opportunity to train and qualify themselves continuously.	A regulated flow of information to other facilities ensures the continuity of their treatment.
They can save financial resources.		
New employees and colleagues are onboarded more easily.		

Figure.1-Advantages of Patient-Centricity (Buske & Medizinio, 2022)

3.1.1.1 - The Value of Patient

Patient voice refers to the idea that the health ecosystem needs to do a better job in hearing what patients have to say about their experiences, needs, values, priorities, preferences, and expectations related to having a disease and managing it, starting with their journey to diagnosis, symptoms, burden, and impacts, and perceptions regarding treatment-related benefits, risks, burden, tradeoffs, unmet needs, and access. (Perfetto & Pomerantz, 2021).

In recent years, significant shifts in policy, payment, technology, and demographics have been transforming medicine and health care. None of these changes have been more profound than the increasing influence of the patient's perspective on health care. In this context, the Oxford Dictionary defines *a* patient as a patient undergoing therapy or registered for treatment (Perfetto & Pomerantz, 2021).

Attending to the patient's voice is very important to the evolution of the healthcare systems, pharmaceutical companies, hospitals, and other health institutions need to integrate and evolve the patient, becoming more sensitive to his voice, reaching better outcomes and better health conditions for the patient (Perfetto & Pomerantz, 2021).

For over a decade, growing consideration of the patient's views related to care delivery, research, medical product development, and other aspects of our health ecosystem. This focus is often referred to as capturing the patient voice and emphasizes the need for the health care system to be patient-centered by engaging patients (and care partners and family members) and listening to their perspectives on and experiences with an illness and treatments (Perfetto & Pomerantz, 2021).

3.1.1.2 - Value-added medicines

In the pharmaceutical area, for example, defining the value or added value of medicines is not simple and is very tricky. Accurate and objective information about how it is possible to make people healthier and the value meaning for patients is required. However, many branded and generic pharmaceutical companies aim to develop new portfolios to enter new markets, increase market share, or improve their market position in the currency markets due to the value creation strategy for the existing medicines (Barei, 2018).

Value and Value-Added are not static terms, they change over time and cannot always facilitate market access, but they can adapt to changes and new demands. The value is different from one group of patients to another, investing in a patient-centricity approach and working with patient groups to better understand their needs is the best way to provide value and develop it. In the last years, generics, hybrids, refined pharmaceuticals, and mee too versions are emerging, and have been in constant development, creating a new label between generics and originals is not an easy task. It requires clever marketing and scientific proof. The biggest obstacle for the so-called value-added medicines may be their inability to attain more significant profit margins and fix higher prices under the current pricing frameworks. The only way added value can support more intelligent medication pricing scenarios and market access is by putting the patient's needs first and developing new technologies to address those requirements (Barei, 2018).

A company creates value to own a solid market position, a competitive edge, and a positive reputation. Otherwise, without value, there is no interest in producing it (Barei, 2018).

The competitive added-value creation is focused on market entry or establishing a positive and long-lasting reputation for the business through patient-centricity (Barei, 2018).

Instead of concentrating on purely economic value, value-added treatments should emphasize the therapeutic value. Middle-sized generic enterprises that believe this strategy is worth doing to differentiate their business view this as a critical investment entirely. Value-based pricing, emerging new technologies, new forms of academic alliances with small drug delivery firms, declining generic opportunities, and increasing regulatory pressure have all altered the pharmaceutical industry's scenario for upcoming investments. The next generation of medications must meet unmet medical requirements while also being remarkably safe and effective to meet the demands of this new paradigm (Barei, 2018).

Improved value-added treatments that are high quality, low risk, and convenient can promote patient compliance while also being efficient, safe, sustainable, cost-effective, competitive, and inventive. Additionally, these tools might reduce stakeholder ambiguity regarding the timing and scope of reimbursement decisions (Barei, 2018).

Pharmaceutical companies' value-added strategies rely on patient-centricity goals, which can improve safety, adherence, and services; and relevant aspects of pharmaceutical design, such as choosing the administration route, tablet size, and shape, making it simple to open the package, and having the ability to read user instructions or adhere to recommended (in-use) storage conditions (Barei, 2018).

As well as objectives and projects related to market access that aim to develop new market sectors, improve competition, or address sustainability issues (Barei, 2018).

3.1.1.3 - Establishing Return-on-Investment Expectations for Patient-Centric Initiatives

In recent years, numerous patient-centric initiatives have supported drug development planning and execution. Patient-centricity, described as a holistic philosophy and practice that seeks to involve patients and the healthcare community as partners in drug development, represents a fundamental and profound shift from a product-centric research and development (R&D) paradigm that has existed for decades but is now characterized by delays, inefficiencies, and high failure rates (Kenneth Getz, 2015).

Implementing patient-centric initiatives is necessary, as offering enough assistance, establishing reasonable expectations, and demanding a good return on investment. Patient-centricity's overarching objective is to foster engagement among patients and the people who provide them with health care and give them a sense of ownership over the development of new medical therapies (Getz, 2015).

There are four patient-centricity principles guiding clinical research enterprise planning and execution:

Relevance: Patient-centric research focuses on unmet medical needs identified via collaboration with and based on patient feedback and their support network in the medical community (Getz, 2015).

Realism: Clinical trial designs and research agendas that are patient-centric consider the needs and experiences of patients and members of the healthcare community in real life (Getz, 2015).

Suitability: Patient-centric clinical trials are supported by activities that increase convenience and reduce the strain of study participation (Getz, 2015).

Interactivity/participatory: Patient-centric research planning and execution amplifies and responds to the patient's voice, receives support from the patient community and its more extensive network of healthcare providers and payors, and provides the patient community with the opportunity to be actively involved and respected partners throughout the research process (Getz, 2015).

Numerous large and small organizations are focusing on this new paradigm to pilot and carry out initiatives across the drug development continuum of activity. The activities listed in Table.1 are grouped according to the fundamental values they uphold. Precompetitive alliances are being created by sponsor organizations in collaboration with patient advocacy groups to understand unmet medical needs better, to jointly set research agendas, to raise funds and community support for R&D projects, and to get community input on protocol designs to increase feasibility. Using patient advisory boards, one-on-one interviews, crowd-sourcing, and social media. Several pharmaceutical and biotechnology companies are starting to incorporate patient input into research design. Sponsors and contract research organizations (CROs) are testing new strategies to make it easier for participants to participate in studies (Getz, 2015).

Core Principles	Initiatives
Feasibility and relevance	• Protocol feasibility review committees • Patient advisory boards • Professional panels • Advocacy group support and involvement • Open design and crowd-sourcing • Adaptive trial designs and adaptive licensing • Real-time data collection • Direct-to-patient clinical trials
Pragmatic and convenient	

Participatory	• Real-world, practice-based clinical trials • Home nursing networks • Telemedicine • Wearable electronic patient-reported outcome devices • E-consent • Centralized/integrated clinical and electronic health record data • Lay-summary risk management reports • Lay-summary clinical trials results

Table.1-Patient-Centric Initiatives Being Piloted and Implemented (Getz, 2015).

To leverage electronic health information, sponsors and CRO companies are forging closer ties with various healthcare delivery systems. By doing this, businesses seek to find areas where medical interventions might be enhanced and more precisely targeted, as well as locate and contact individuals who might gain from participating in clinical trials more quickly and effectively. CROs and sponsors have begun to support more rational clinical trials conducted in real-world settings, not the traditional approach based only on profit (Getz, 2015).

This partnership under patient-centric research and discovery (R&D) requires disclosure and openness of the clinical trial results to investigate volunteers and patient communities (Getz, 2015).

Challenges

There are many challenges to the successful implementation of patient-centric, and many reasons make it difficult to measure. Transforming patient-centric will not be easy and will take patience. Clinical research professionals gradually incorporate new techniques and approaches into their already taxing and difficult operational and scientific processes. Some experts are hesitant to include another viewpoint because they think that will be difficult to work with patients, healthcare payers, and providers and add

complexity. Many clinical research experts worry that patient-centricity is forcing them to abandon conventional methods, such as blinded, randomized controlled clinical trials and according to some stakeholders, involved and interested patients may desire to see their clinical trials successful, which could lead to bias in the study results (Getz, 2015).

Expectations

It is expected that most of the patient-centric initiatives will likely have little, if any, impact on the costs, length, and effectiveness of clinical trials shortly. Numerous piloted efforts have caused delays, disruptions, and increased expenses. As implementation would be unequal in the short term, it is also likely that the impact of patient-centric efforts will differ significantly from study to study (Getz, 2015).

However, it will be advantageous to manage and plan activity centrally. By doing this, the organization will become more informed and more coordinated, and it will be easier to share the lessons acquired from previous implementations and similar businesses (Getz, 2015).

The expectations for return on investment (ROI) must be reasonably considered in the long term. Clinical teams and their collaborative partners need time to gain experience with patient-centric initiatives, learn from errors, and continuously improve their utilization. As a result, 2 to 3 years before and following the implementation of initiatives, benchmark measurements from numerous representative studies should be acquired. Stakeholders have evaluated three main areas: reach, patient/study volunteer feedback, and performance—using several essential implementation and ROI measures (Getz, 2015).

Reach metrics are frequently quantified. Their main goal is to evaluate how widely a specific project has been adopted and used inside organizations and how many patients and research volunteers have taken part (Getz, 2015).

Many firms have included specific quantitative feedback metrics, primarily qualitative, into the mix. Their main goals are to evaluate people's subjective satisfaction ratings, their sense of involvement in each study or relation to a particular project, and their perceptions of the applicability of clinical trials. The effectiveness of patient/study

volunteer participation has been quantified and shown to be a good change agent (Getz, 2015).

Performance metrics are quantitative and compare studies that use patient-centric initiatives with those that do not. The Metrics Champion Consortium developed and gathered consensus metric definitions, which most companies use. These metrics' main goals are to collect concrete evidence of improvements in feasibility and convenience (Getz, 2015).

To conclude, patient-centricity is anticipated to shorten drug development cycle times, increase productivity, and distribute R&D expenses and risk among numerous collaborating partners. Engaged patients and their network of healthcare advocates will help sponsors improve the feasibility of clinical trials, speed up patient recruitment and retention efforts, and garner support from critical and peripheral stakeholders in drug development and the commercialization of novel medical interventions (Getz, 2015)

3.1.2 – Patient-Centricity in Pharma Business

When we mention patient-centricity, pharmaceutical is always one word that jumps into our heads, because the whole lifecycle of a medicine aims to contribute to the patient's well-being and improvement of life.

The pharmaceutical business is essential to the healthcare system in any nation because it supplies medicines that directly improve the standard of living for the population. Along with the direct advantages for the people, medicines also significantly lower the total cost of healthcare in each nation by negating the necessity for expensive surgery and prolonged hospital treatment. The pharmaceutical business is particularly significant and emphasizes the industry's economic significance for a country since it is a crucial component of ensuring the financial viability of any healthcare system (Marques et al., 2020).

The pharmaceutical industry has profited for many years from a business model focusing on discovering and developing profitable pharmaceuticals (blockbuster drugs). These earnings were then used to fund the development of new medications by reinvesting a sizeable percentage of them in R&D. Product innovation, and new product debuts accounted for almost all the competition. When compared, for example, to R&D expenditures, manufacturing costs (the cost of goods sold) were deemed to be a small

enough portion of the companies' cost structure, and operational, or supply chain efficiency was not given importance by the decision-makers (Marques et al., 2020).

In recent years, the market conditions for pharmaceutical companies have changed, considering the current trends, which point to fewer blockbusters, more specialty and individualized drug goods, stricter quality control, increasing competition from me too products and generics, and more globally and geographically scattered markets. The healthcare operating landscape is in adjustment (Marques et al., 2020).

Along with market and political dynamics, scientific and technological advances have paved the way for new directions in the pharmaceutical sector and posed a threat to its established business model (Marques et al., 2020).

So, what are the drivers that impact the pharmaceutical supply chain operations?

External Drivers	• Increasingly regulatory burden • Pricing (and resulting cost) pressures • Growth of personalized medicines • Growth of emerging markets • Sustainability concerns • Increased uncertainty and risk
Internal Drivers	• A decline in R&D productivity • Decrease in effective patent life • Growth in SC complexity

Table.2 – External and Internal Drivers that Impact Pharmaceutical SC Operations (Marques et al., 2020).

Patient-centricity inside the pharma business is of great relevance, the pharmaceutical sector is currently subject to fierce rivalry. As previously indicated, growth rates are diminishing, the number of novels, and ground-breaking ingredients is constantly declining, and many key blockbusters medicine patents will expire in the upcoming years. Also, the push to lower healthcare costs is driving up the market share of companies that make inexpensive, patent-free generic medications. Thus, it is necessary to reassess how medications are positioned strategically. Only a few companies are customer-oriented (Burmann et al., 2010). Most companies focus on traditional models, with sales force

representatives as professional advisers informing physicians about the effects, therapies, and side effects of selective drug detailing (Burmann et al., 2010).

Pharmaceutical products are becoming replaceable by patent expiry and the upcoming number of ingredient-equivalent generic drugs penetrating the market and contracting research pipelines with a smaller number of new innovative ingredients (Burmann et al., 2010).

It becomes necessary to know the customer's interests and needs. Interests and needs are pretty different, and customer-centricity can be the problem solver. It devotes the question of how companies can manage their customers optimally. Customer-centricity is, therefore, the most consistent constitution to manage companies from a customer perspective, which changes the work with management and employees. Customer-centricity includes customer goals, the integration of customers within the corporate strategy, and the implementation of customer-oriented activities (Burmann et al., 2010).

In the case of pharmaceutical companies, when a medicine is prescribed, the patient is the consumer. The payor side is made up of health insurance funds acting as reimburses. The decision-maker in this situation is the doctor who is writing the prescription. As a result, the pharmaceutical sector has a sophisticated network of clients (Burmann et al., 2010).

And how to become customer-centric? The customer-centricity method should primarily be implemented in three steps that link the corporation's marketing initiatives and business procedures with economically relevant customers (Burmann et al., 2010).

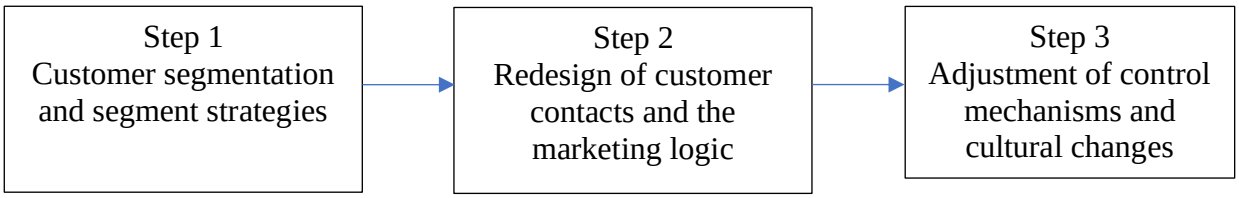


Figure.2- Customer-centric approach (Burmann et al., 2010).

Step 1: The creation of customer knowledge from two distinct perspectives—the financial worth of a customer and the demands and expectations of customers—is the first stage in building a customer-centricity orientation. The economic perspective significantly affects investing choices (Burmann et al., 2010).

Step 2: Based on a superior understanding of client segments, messages, and communication channels, tailored solutions will have a higher impact on the value of the customer portfolio. Therefore, updating all client touchpoints and synchronizing the marketing strategy is necessary (Burmann et al., 2010).

Step 3: The customer-centricity strategy involves a substantial shift in how the company views and interprets its business activities. Internal control mechanisms and key performance indicator (KPI) systems must be implemented, and top management must prioritize the issue to flourish within the organization. A change effort like customer-centricity only has the potential to succeed with the aid of considerable top-level assistance.

Customer-centricity is a cross-functional and cross-business model strategy to serve customers effectively and efficiently in a market and behavior-changing environment (Burmann et al., 2010).

Besides physicians and payors, the patients are another primary customer and the one to focus on. Patients can affect prescribing choices even if they are the only pharmaceutical industry consumers. Patients are becoming more and more knowledgeable because of changes in the information-gathering process. Information is readily available online and social media is having a larger impact, patients can independently determine an initial diagnosis. They can assemble information about prescriptive drugs with the help of the internet, blogs, forums, and social networks, which influences the patient-physician relationship (Burmann et al., 2010).

Another indirect way to implement patient-centricity is to segment physicians by their patient structure. The physicians working in rural areas, dominated by older people, have specific requirements for medication and services for this age sector. Therefore, it is possible to segment doctors based on their patient structure using standard personal segmentation parameters like sociodemographic lifestyle and needs-based criteria (Burmann et al., 2010).

However, there are pharmaceutical industries where a direct customer-centric strategy is practicable. In over-the-counter markets, patients can choose whether or not to take medications. These markets offer the possibility to segment patients directly. Patient

management can be done in various ways with the support of the customer-centric approach. Both directly and indirectly can assist in managing the company-patient connection through the company-physician interaction. Thirdly, the patient's needs and requirements can influence the research and development process, creating patient-oriented therapies. Developments in developing new treatments are always needed, but if the patient doesn't accept these developments, they are superfluous and inefficient (Burmann et al., 2010).

The pharmaceutical research and development process must also be patient-centric. Additionally, it is essential to incorporate patient-centricity throughout developing, launching, and promoting therapies. A patient-centric strategy directly helps the internal managing procedures, the interaction between a pharmaceutical firm and its patients, and its indirect relationship with doctors (Burmann et al., 2010).

However, several pharmaceutical companies implement the above strategies just in parts and not with a deep understanding of patient-centricity, which is necessary for a complete implementation. Pharmaceutical companies may be forced to integrate customer-centricity thinking by specific internal and external drivers. But there are also substantial obstacles (Burmann et al., 2010).

The main driver is the internal commitment of the top-level management. Client-centricity will not succeed and is becoming a barrier if the customer is not committed to being one of the primary control quantities within the company. Another driver is customer-centricity knowledge. Customer-centricity knowledge includes every step of the process, from the potential for gathering customer insights to the capacity for customer segmentation since customer strategies must also be put into practice and integrated into the four p's (product, pricing, promotion, and location) of the marketing mix (Burmann et al., 2010).

The viewpoint based on the external market is equally crucial. Therefore, knowing your customer is a critical factor. This is essential, especially in the pharmaceutical industry, where the client network is intricate (Burmann et al., 2010). Another significant barrier or driver is the competitive environment. It depends on how well the big competitors have implemented customer-centricity (Christoph Burmann et al., 2010).

Changing the business model of a company is not easy at all. We are talking about long periods following a different model, and applying the patient-centricity approach will not be accepted and successfully implanted in a couple of weeks and a fraction of the company. This process takes time, and the entire company's complete renovation and commitment are necessary (Burmann et al., 2010).

Setting the fundamental presumptions for applying the customer-centricity approach is a significant task for businesses (Burmann et al., 2010).

Patient-centered care views the patient as a crucial source of guidance for their objectives and preferences. It gives the patient the authority to work with physicians to manage care, using their capacities for observation and reporting. There are numerous justifications for doing this. The patient is the one that has the most to gain and is willing to work for free, which is excellent for the companies. A minimum set of technical capabilities is mandatory for the patient to be fully engaged in the process. First, every patient needs to have a lifelong medical record that compiles their medical history into a single logical framework. Second, the creation of tools that can inform patients about pertinent issues, prospective outcomes, and trade-offs in various courses of action. Third, a patient-centered healthcare system must facilitate successful communication between a patient and peers and healthcare professionals in patient communities that presently assist one another by exchanging experiences via newsgroups and websites. Finally, suppose the patient is truly in charge of making daily decisions regarding their treatment. In that case, we should assist that decision-making with advising systems. The ultimate objective of patient-centered care is to encourage each person to engage in behavior that will promote wellness and avoid disease, not simply to improve the delivery of healthcare interventions after the patient is ill (Szolovits, 2011).

Is no secret that the pharmaceutical industry has been facing multiple challenges in recent years. A less encouraging research pipeline coexists with a sizable number of expiring patents. The pressure on healthcare costs is increasing, helping generics' position more and more. And because of that, business models successfully implemented over decades are no longer feasible. The orientation of pharmaceutical companies must change. Change to the patient-centric approach, which is now at the heart of pharmaceutical business strategy. To regularly rewrite and update the value proposition of their products, businesses will need to connect with patients more strategically,

focusing on understanding their requirements, expectations, and worries. Through cutting-edge technical advancements (such as digital capabilities), new product-service solutions will be required, and further distribution and information channels will need to be developed to strengthen patient interactions and establish partnerships based on trust. The volume of data will exponentially rise, necessitating data analytics to transform it into information that can enhance therapeutic outcomes (Burmann et al., 2010) (Marques et al., 2020).

What is, in fact, customer-centricity? The notion of customer-centricity holds a lot of promise because it puts the marketing operations and procedures of the company focused on clients, doctors, patients, and payors in a broader sense. It adds a strategic and long-term focus to customer relationship management (CRM) efforts (Burmann et al., 2010).

Pharmaceutical firms can differentiate themselves sustainably from the competition in the future thanks to the continuous use of the customer-centricity approach (Burmann et al., 2010). Pharmaceutical companies also need to apply patient-centricity systematically to the design of pharmaceutical drug products. This design relates to many elements of the medication regimen, for instance, how the drug is to be taken (e.g., orally or intravenously), when and with what sort of additional tools (e.g., dosing devices, instructions for use) (Lorenzini & Olsson, 2022).

Patient-centricity has been called for from different stakeholders and perspectives, from regulators to patient advocacy groups. For example, since 2014, the US Food and Drug Administration (FDA) has made efforts to establish the grounds for patient-centricity by discussing the impact of diseases in their lives and how to develop more effective and user-friendly medical interventions. The Patient Engagement Advisory Committee (PEAC) is one of the FDA's efforts. It comprises patients, caregivers, and representatives of patient advocacy groups discussing relevant issues affecting patients. The focus is to increase patients' influence and level of participation in decisions that directly affect their healthcare, from clinical trials to treatment delivery (Lorenzini & Olsson, 2022).

Patient-centricity is not a static definition, different approaches contribute to it. One thing that can be more patient-centric in the pharma business is the packaging. Most of the medicines are not focused on this part of the product development, and a significant

amount of the population experience difficulties in the intake of drugs, leading to errors in the administration and consequently lack of efficacy of the medicines. However patient-centered packaging comes with challenges and opportunities for developing improved patient solutions and training for the relevant teams. Building a business case that supports such development, one where patient demands are present from the outset and aligned with other crucial dates of drug development, with stakeholders aboard, is essential to overcoming these obstacles. Due to the usual approach, where packaging serves as an adjunct to medication protection, in terms of packaging design, patient-centered packaging is the exception rather than the rule. (Lorenzini & Olsson, 2022).

Patient-centricity is as mentioned before the practice of placing the interests of the patient at the center of all decisions and incorporating patient input into decision-making processes. In essence, it represents a holistic approach to disease management. Although many agree that patient-centricity is a concept to be embraced, there is still little published guidance. In practice, significant variability exists in its implementation by the pharmaceutical industry. Why is patient-centricity coming to the fore today? Is it a reaction to the changing environment of a world where patients are ever more connected and informed, or is it the realization of an ethical responsibility across the healthcare system? Is it realistic for a company operating in a commercial environment to place patients at the heart of everything it does (Plessis et al., 2017)?

Patient-centricity demands a shift in cultural mindset within the pharmaceutical industry. At the highest level, it involves listening to and partnering with the patient and understanding the patient's perspective rather than simply inserting patient views into the established process. Only then can patient-centered outcomes indeed be the core of the strategy. If patient-centricity is the responsibility of everyone in a pharmaceutical company, critical development, and performance indicators (and possibly remuneration structures) should be adapted to reflect this change in mindset. These performance indicators could include the proportion of product strategies that are based on actual patient input, the number of patients involved, patient feedback based on ratings of patients' involvement (e.g., how engaged/involved/satisfied they feel), number of study protocol revisions implemented as a consequence of patient input, the relevance of new product profiles to the self-identified needs of the patients, and improving the information

available to patients and prescribing physicians on the risks and benefits of treatment so that better decisions for the patient can be made (Plessis et al., 2017).

There are several challenges that need to be overcome before the pharmaceutical industry can adopt the patient-centricity concept. Challenges to address include skepticism about commercial success, lack of process standardization as it relates to involving lay people in a highly regulated environment, insufficient sharing of practices and lessons learned across the industry, missing the understanding and respect for qualitative research methods that often form the foundation of patient-centricity research, not align and measure the collective progress, internal habits of going back to established information sources, compliance frameworks and the perception that direct engagement of industry with patients is inappropriate or unauthorized, and last but not least, the conflict of responsibilities, the perception that industry should not be the party that engages with patients (Plessis et al., 2017).

Most of these challenges can only be solved collaboratively, as discussed above. Some solutions are beginning to emerge, highlighting the need to share and learn from each other's experiences. For instance, a compliance framework has already been developed and is available to guide direct engagement with patients by industry (Plessis et al., 2017). Pharmaceutical companies are at different stages along the patient-centric journey.

As an example, UCB has a medication for Parkinson's disease, patients with Parkinson's disease need to take their medication simultaneously each day as their motor function can be very sensitive to changes in this rhythm. If these patients are hospitalized for a different reason, the hospital rarely has the medication for control of motor symptoms readily available, the intake is delayed, the patient's condition deteriorates, and they spend 2-3 days longer in the hospital than if appropriate medication were readily available. Understanding this scenario helped UCB to implement relevant solutions in collaboration with treating hospitals, ensuring these medications were available, this in turn, led to a decrease in hospitalization duration for patients with Parkinson's disease. Thus, insights into disease breakpoints can help provide better outcomes for patients (Plessis et al., 2017).

Another example is AstraZeneca´s approach to patient-centricity, AstraZeneca has a focus group to facilitate patient-centricity internally, according to AstraZeneca, patient-centricity is the open and sustained engagement of the patient to achieve the best experience and outcome respectfully and compassionately for that person and their family, in this conceptual model, patient insights drive innovative solutions that in turn create positive effects for the patient. The patient-centricity approach engages with patients through several research and therapeutic areas of collaboration, more than 30,000 patients are now connected with AstraZeneca research projects. AstraZeneca is also setting up disease-specific and patient/career networks (e.g., Patient Expert Network) to advise the development/brand teams on co-creating patient solutions. This means a better understanding of patient experience at critical points (breakpoints). AstraZeneca engages with patients through research and therapeutic area collaborations using online patient platforms and networks (Plessis et al., 2017).

After everything has been said, it is anticipated that patient involvement in research and development will offer more advantages at different stages of the drug development process, including:

Identifying unmet patient needs, allowing for more informed decision-making regarding target options and the necessary asset profiles for go/no-go choices. More patient-relevant research designs and endpoints improve patient recruitment and retention and supply regulatory and reimbursement decision-makers with unambiguous, patient-relevant evidence. A quicker transition from the trial phase to regulatory submission for medications. A wider selection of goods that are more valuable to patients overall. Increased patient adherence to medication regimens results in better patient outcomes. Accumulating data on patient preferences and unmet needs can assist in a direct future study (Plessis et al., 2017).

There is mounting proof that patient involvement in drug development and discovery is beneficial. The industry is a significant stakeholder in making patient-centricity a reality but cannot bring this about alone or set the agenda. Equally, however, neither can medical professionals, government, or policymakers. How and with whom to partner is the critical challenge. The future of patient-centricity lies in coordinated efforts and the alignment of multiple healthcare stakeholders. Patient-centricity can be achieved only

through collaborations and consortia that include all healthcare stakeholders, in which the pharmaceutical industry has a crucial role (Plessis et al., 2017).

To conclude this chapter, is important to mention one important measure of the patient-centricity approach, the PROs (patient-reported outcomes). These PROs are becoming the best and primary trusted evidence for all the stakeholders (payers, regulators, patients) (Plessis et al., 2017).

It is anticipated that patient-centered drug development will alter how the pharmaceutical sector conducts business. To establish standards for all pharmaceuticals, PRO tools, and metrics should preferably be created in a pre-competitive collaborative manner (Plessis et al., 2017).

All-important stakeholders, such as regulators, patients, prescribers, payers, and anybody who reviews the data, will find it more straightforward to evaluate a uniform method like PROs measures. Figure. 3 explains how patient-centricity can be achieved using these PROs (Plessis et al., 2017).

Why be part of the patient-centric movement?	How can the pharmaceutical industry become patient-centric?	What does a patient-centric company do?
The pharmaceutical industry's cause is to serve people living with a disease	Shift the cultural mindset	Move from a brand focus to a patient value focus
	Build trust	Involve patients in R&D
	Learns from others	Coordinate efforts to standardize PRO measures
	Align and collaborate	Expand the pool of expert patients
		Educate patients

Figure 3. How patient-centricity can be achieved in the pharmaceutical industry (conceptual framework). PROs, patient-reported outcomes (Plessis et al., 2017)

Patient-centricity is undoubtedly a business improvement. The companies that successfully implement it, will stand out. In business healthcare, especially in a pharmaceutical's competitive environment, every differential aspect makes a difference,

but this implementation is not as easy to accomplish as previously shown. There are other factors that condition the patient-centricity approach? Why not all companies implement this strategy? How is the theme organized? What are the main subjects of the theme? How has the theme evolved? What is the evolution/contextualization of patient-centricity?

3.2 – Patient-Centricity - VosViewer analysis

The results' analysis focused on the outputs of the software VosViewer, the creation, visualization, and exploration of the maps using Scopus data. For these, different types of visualizations and various kinds of network analysis systems were used. This method could analyze all the articles about patient-centricity inside Scopus. The literature review using VosViewer analysis provides a deeper understanding of the state of the art.

The use of clustering algorithms is widely used in bibliometric studies. For example, they are employed to classify collections of linked publications, writers, or journals. In the domains of statistics, computer science, and network research, clustering techniques have been primarily developed. Bibliometricians usually do not build their clustering techniques but use existing clustering techniques developed in other areas. They apply these methods to bibliometric data sets, occasionally after tailoring the procedures to the unique properties of bibliometric data. The cluster analysis aims to create from the dataset, a group of items with similar indicators, relations, or links (Eck et al., 2010). Clusters that are adjacent to one another on the map represent fields that are closely related. Only one cluster is required for an item to belong, and clusters do not have to include every item in the network. As a result, some things might not fit into any cluster. The weight and score qualities are the two most crucial variables in cluster analysis. Each object includes these properties, which are represented by integer numbers. The relevance of an item is then determined by its weight property, which also controls how prominently it is displayed in the visualization of the active map. The size of an item's label in the representation increases with weight. In addition to determining the variable that will be visualized on the map, the score attribute also affects the color of the elements in the visualization of the active map. By default, the closer an item's color is to yellow, the higher (lower) its score (blue) (Eck et al., 2010).

3.2.1 – Co-authorship (Authors)

Co-authorship uses authors as a unit of analysis. This type of analysis clarifies the relationship between different authors in different articles. The clusters divide authors generally co-authors in the same papers and separate the patient-centricity articles into distinct groups of authors and co-authors, precisely 12 clusters. Highlight the cluster numbers 1, 2, 3, and 4. Co-citation relations (i.e., relations between publications cited by the same publication). Using the database of Scopus, the creation of clusters associated with the query co-authorship identifies a total of 545 authors, but for better visualization of the results and to ignore the documents with no link with each other, a threshold was applied based on the minimum number of papers per author. Two is the number selected, so from the 545 authors, only 59 were eligible—the present results just analyze these 59.

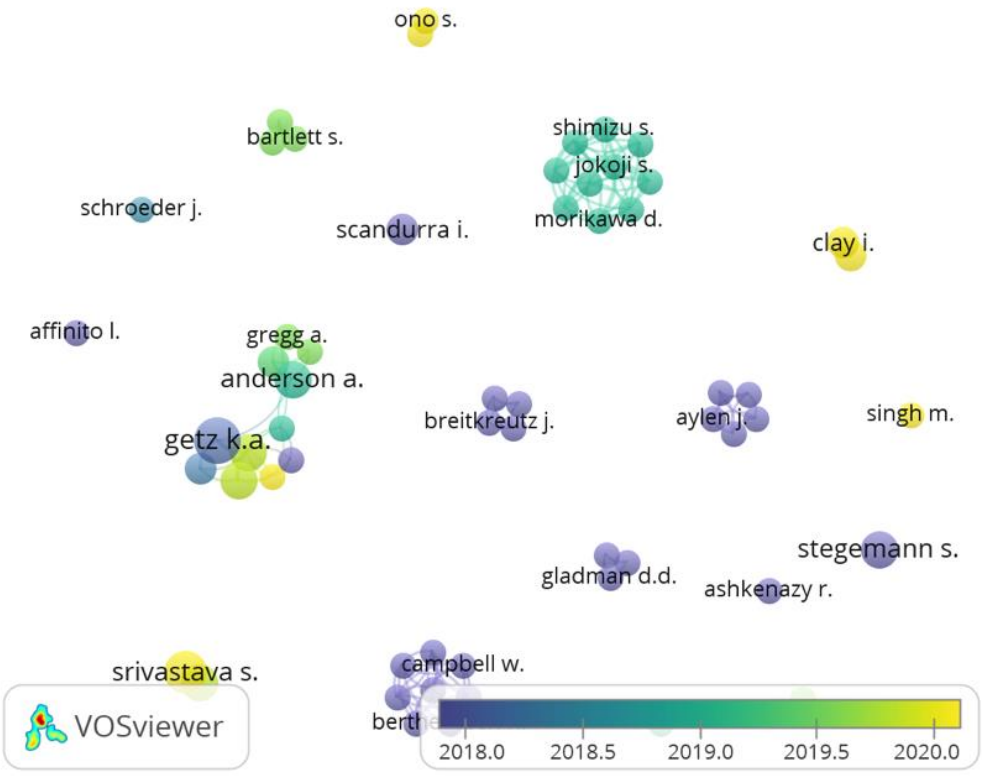


Figure. 4 Authors citations Overlay (Source: VosViewer)

This figure, as a total number of 19 clusters created. The number of citations and closeness between some authors indicate the degree of connection among those authors in terms of citations and publication connectivity, with the largest size in terms of visualization

denoting a higher number of citations. The authors with more visualization are described in table 3.

Author	Document	Citations	Total link strenght
Breitkreutz j.	2	79	6
Frijlink	2	79	6
Visser J.c	2	79	6
Woerdenbag h.j	2	79	6
Stegemann	4	46	0
Getz k.a	6	42	11

Table.3-Authors with more citations

The four authors with more citations have two documents in common. The authors in both documents highlight the importance of oromucosal film preparations based on the patient. The first document, "Oromucosal films: from patient-centricity to production by printing techniques," discusses the transition from conventional solvent casting to printing procedures in the creation of oromucosal films, which include mucoadhesive buccal films (MBFs) and orodispersible films (ODFs), these dosage forms are considered patient-centric, and the target group is patients with special needs. Films applied directly to the oral cavity are regarded as patient-centric dose forms with good patient acceptance. The European Medicines Agency has defined patient acceptance as the capacity and readiness to use medication as intended. To ensure adherence to medical therapy and reduce medication errors, patient acceptability has recently emerged as a critical factor to direct therapeutic product development. The potential of consuming them without oromucosal films makes them attractive drug-delivery systems for patients with unique needs due to qualities such as thinness and flexibility, simplicity of handling, dosage flexibility, and a small amount of water. (Tian et al., 2019).

The small amount of drug load that can be contained is a significant barrier in oromucosal film fabrication. Increasing the film's surface area or thickness is a reasonably easy way to enhance the drug load. The use of multi-layered oromucosal films is an additional choice. These films may, for example, be prepared using the solvent casting method. The solvent casting process is still the most popular oromucosal film preparation technique. In essence, an appropriate solvent is used to dissolve all the excipients (usually water). The solution is set, left to dry, and then sized to the required shape. Recently, printing methods for creating oromucosal films have been suggested. Oromucosal films are recognized as a group of patient-centric dose forms appropriate for individuals with particular needs, such as kids or older people with dysphagia. The dosage

form's design can be improved for patient acceptability. User-friendliness, disintegration time, and stickiness are crucial factors in patient acceptance. Orodispersible films (ODFs) are predominantly used to treat systemic disorders, whereas mucoadhesive buccal films (MBFs) are utilized to treat systemic and local diseases. (Tian et al., 2019).

In the second paper from these authors, "Oromucosal film preparations: points to consider for patient-centricity and manufacturing processes," the authors highlight the relevance of these dosage forms in patient-centricity, oromucosal films are gaining increasing interest both as commercially available pharmaceutical products and extemporaneous preparations for personalized use (Krampe et al., 2016).

Oromucosal films are easy to administer, and their administration does not require the intake of large fluid volumes. Moreover, the option that these films can be cut into virtually every size gives them enormous flexibility for individual dosing. These aspects make oromucosal films a highly acceptable novel dosage form, especially for patients requiring personalized medicine or adjusted doses (e.g., children and the elderly). Essential performance characteristics of oromucosal films include an acceptable taste, appearance, mouthfeel, and the absence of irritation of the mucosa (Krampe et al., 2016). It's important to note that inside pharmaceutical companies, the efforts and means to achieve adherence are on the way. These films are proof of that, a way to evolve medicines based on the patient. They offer extended possibilities for individualized pharmacotherapy. However, there are some problems to be solved before, and more research is needed, but the pharmaceuticals are on the right track.

Apart from these most quoted authors, Stegemann is the next in line with four documents and more than 46 citations, one of his most interesting articles, "Challenges and opportunities to include patient-centric product design in industrial medicines development to improve therapeutic goals". In this article, the goal is the same. In the past, drug developers in the industry chose approaches mainly focusing on the drug product's efficacy, safety, and quality according to the level required by regulatory expectations stipulated in guidelines, pharmacopeia, and other regulatory provisions. By focusing more on the patient perspective, regulatory authorities are raising their requirements regarding successful product submissions. The increasing involvement of patients in the product development process requires adaptations to the existing and

established industrial drug development process without compromising fast patient access to innovative therapies (Timpe et al., 2020).

To ensure that these patients can use medicines as intended, even within complex therapeutic situations, patient-centric drug product design has emerged as an additional quality criterion in pharmaceutical drug development. Since there is increasing awareness of the patient as an essential stakeholder in achieving therapeutic outcomes, regulatory requirements for special patient populations are being raised worldwide (Timpe et al., 2020).

The growing awareness of and demand for patients as a critical factor in achieving therapeutic outcomes led to the development of different regulatory documents directly related to patient populations or indirectly by addressing product attributes. While these documents provide essential guidance on the required data, their implementation into the ongoing development could be challenging (Timpe et al., 2020).

To design a productive and patient-centric medication portfolio by including aspects such as altered physiology, physical functioning, psychology, behaviors, and practical user aspects must be considered within phase 1 and phase 2 of drug development, whereby neither the specific indication nor its clinical proof of concept has already been established. In addition, especially older and multimorbid patients are very heterogeneous populations for which specific needs might need to be prioritized as not all could be covered. In such cases, clinical as well as pharmaceutical priorities must be defined by multidisciplinary teams early on, balancing the desirable against the feasible from a scientific, industrial as well as patient perspective (Timpe et al., 2020).

The concept of target product profile (TPP) is essential. TPP is the guiding document for discussions between a pharmaceutical company (sponsor) and the regulatory authorities that can be used throughout the drug development process as well as to pursue new indications or other substantial changes in the approved indications (labeling) (Timpe et al., 2020).

The pharmaceutical Industry has adopted this. A hypothetical TPP for a route of administration (product attribute), for example, oral or parenteral, can be complicated for some patients by sticking to a complex dosing regimen like patients with dementia.

Patient-centric has a considerable impact, and this impact of patient-centric product design has recently been investigated and demonstrated in rheumatoid arthritis patients. Rheumatoid arthritis patients suffer from deformation and pain affecting hand functions, such as severely limiting their grip and pinch forces. TPP allows the patients to administer a new drug by self-injection. A patient-centric syringe system was developed by considering the capabilities of these patient populations across all age groups. A comparative study with a conventional syringe investigated differences in performance, physical aspects, preference, confidence, willingness to inject, and sex. The study revealed that the new syringe enabled patients to achieve higher injection forces, shorter injection times, and more control over the injection. This led to a clear preference for the new syringe. This example demonstrates the importance of including patients in drug development to gain insights into their capabilities and needs and utilize their input to co-create better drug products (Timpe et al., 2020).

Drug product development is a long-term investment with several uncertainties and risks. The drug development follows a defined yet complex development matrix within a highly regulated process to provide evidence for the desired benefit-to-risk ratio of a new drug. The increasing acknowledgment of the heterogeneity and complexity of the patient populations and the development of treatments for unmet medical needs (e.g., orphan populations) create additional requirements that need to be incorporated into the drug development matrix for future therapies. The challenge is to achieve this without impacting patient access to innovative treatments due to longer development times or increasing development, manufacturing, and hence treatment costs. To avoid unnecessary delays, a rational and systematic approach toward patient-centric drug development is required that provides a balanced roadmap, including product and patient needs (Timpe et al., 2020).

Patient-centric drug products can improve therapeutic outcomes, maintain independent living, improve quality of life and reducing healthcare costs. Collaboration between clinicians, pharmacists, industry, regulators, and healthcare providers is necessary to ensure that patient-centric products reach the patients (Timpe et al., 2020).

The last author of this table with more citations is the Getz k.a with 42 citations and six documents. Some of these documents will be analyzed in further chapters.

3.2.2–- Co-authorship (Organizations)

The query Co-authorship–- Organization was used to extract data from the dataset about the organizations. The minimum number of documents per organization was 2. The output of this criteria was 11 organizations that were divided into 7 clusters. The first cluster has three organizations, clusters 2 and 3 have two, and the remaining groups have just one.

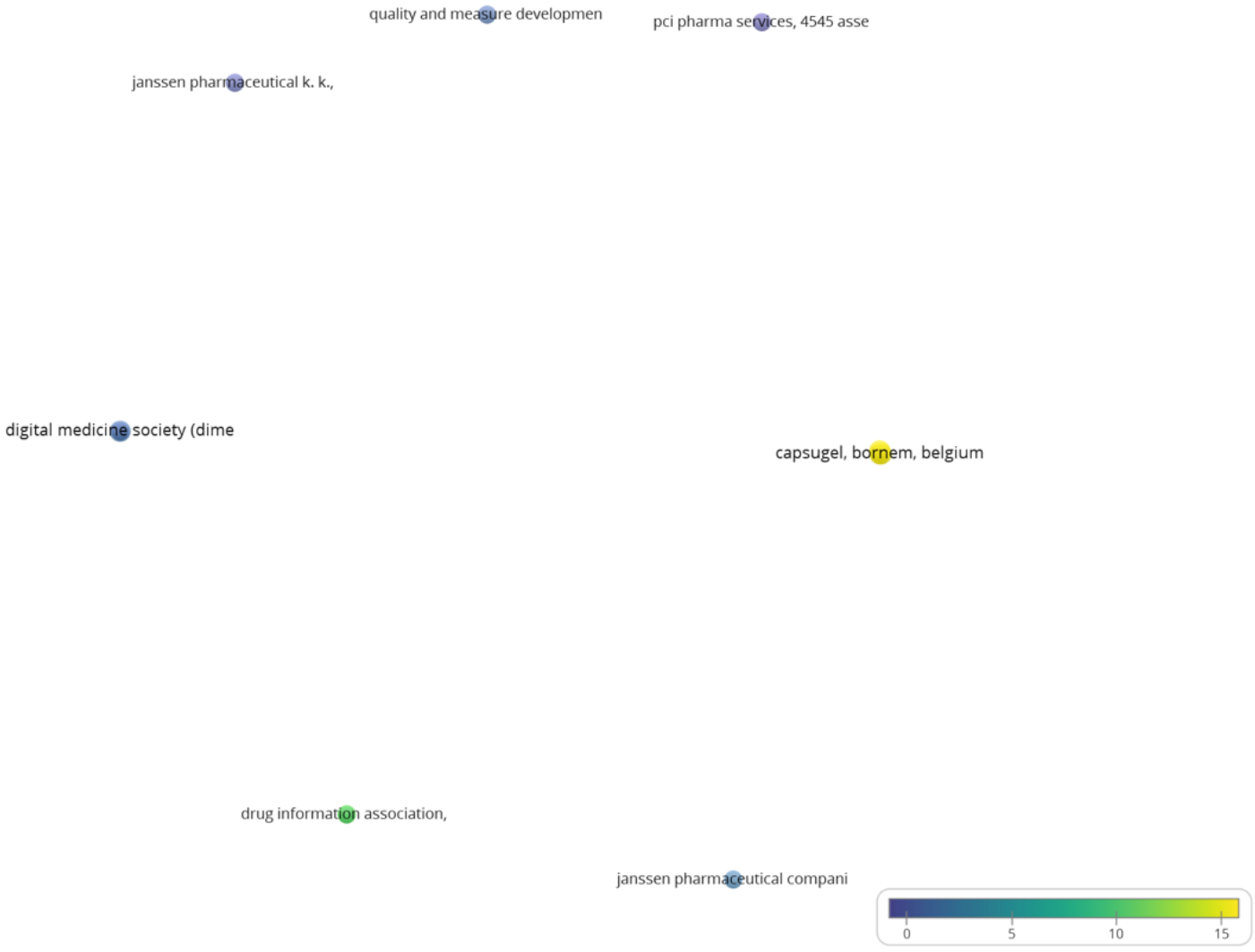


Figure.5 Organizations citations overlay (Source: VosViewer)

Proceeding to the analyses of figure.5, in this figure, the visualization method chosen was the overlay visualization, and the score was obtained based on the average citation. The closer the color of the point is too yellow, the more items there are around, and the heavier the weights of those items are. In this figure 5, the organizations are not very

connected. The distance between positions indicates the relatedness of the clusters in terms of citations. Organizations located in different places indicate low relatedness in terms of citations, which means that organizations close to each other show the opposite. The organizations with the highest citations are presented in the following table 4.

Organization	Documents	Citations
Capsugel, bornem, belgium	3	44
Graz university of technology, Austria	3	44
Digital medicine society	3	6
Eli lilly and company, Indianapolis	3	52
Evidation health, san mateo	2	0
Drug information association	2	19
Tufts center for the study of drug development	2	25

Table.4 Organizations Co-authorship

Table 4, from the 11 organizations obtained, Eli Lilly and Company, Indianápolis, Capsugel, bornem, Belgium, and Graz university of technology, Austria, are the ones with the most citations between the different organizations.

3.2.3–- Co-authorship (Countries)

Using the dataset and the query co-authorship-countries as a unit of analysis, result in 5 clusters, each with a group of countries, and a threshold of a minimum of 2 documents per country was applied. Of the 63 countries only 26 were selected. The results are presented in the following table.

Cluster	Country
Cluster 1	Canada
	Czech Republic
	Hong Kong
	New Zealand

	Singapore
	Switzerland
	United Kingdom
Cluster 2	Denmark
	France
	Italy
	Norway
	Russian Federation
	Spain
Cluster 3	Finland
	Germany
	India
	Netherlands
	Sweden
Cluster 4	Austria
	Belgium
	Brazil
	Hungary

	Japan
Cluster 5	Portugal
	United States
Cluster 6	Australia

Table 5– Cluster Items

Is important to note that not all the nations listed in the dataset are depicted in either figure 6 or 7, as the database's chosen threshold (minimum number of documents required for a country to qualify) needs at least two documents to be eligible. This way, not all the countries are represented in the figures. Only 26 of the 63 countries identified in the dataset are suitable for analysis and presented in the mapped network. The total strength of the co-authorship's ties with other countries will be computed for each of the 26 chosen nations. The selection and description of the nations will be based on the highest total link strength. This way, a better understating of the results is possible. The countries are divided into clusters, as table 5 has shown.

The top 5 countries with the highest total link strength are the United Kingdom, United States, Belgium, Netherlands, and Austria. The description of the top 5 countries based on total link strength is described in table 6 with the corresponding documents and citations.

Country	Documents	Citations	Total link Strength
United Kingdom	23	322	55
United States	64	426	49
Belgium	13	131	39
Netherlands	8	149	31
Austria	9	73	30

Table 6– Top 5 countries based on Total Link Strength

The Co-authorship–- Countries query generated two outcomes, which are described and will be explained in the following two figures, 6 and 7. Figure 6 presents the average number of publications per year, from 1986 to 2022, in which the keyword patient-centricity occurs. The average year of the publications is between 2018 and 2021. Figure 6 also presents the average publication per year, and the United Kingdom, United States,

Belgium, Netherlands, and Austria are the countries with more relevance in terms of average publication per year.

Obtaining these results has been used as weight documents and has scored the average publication year.

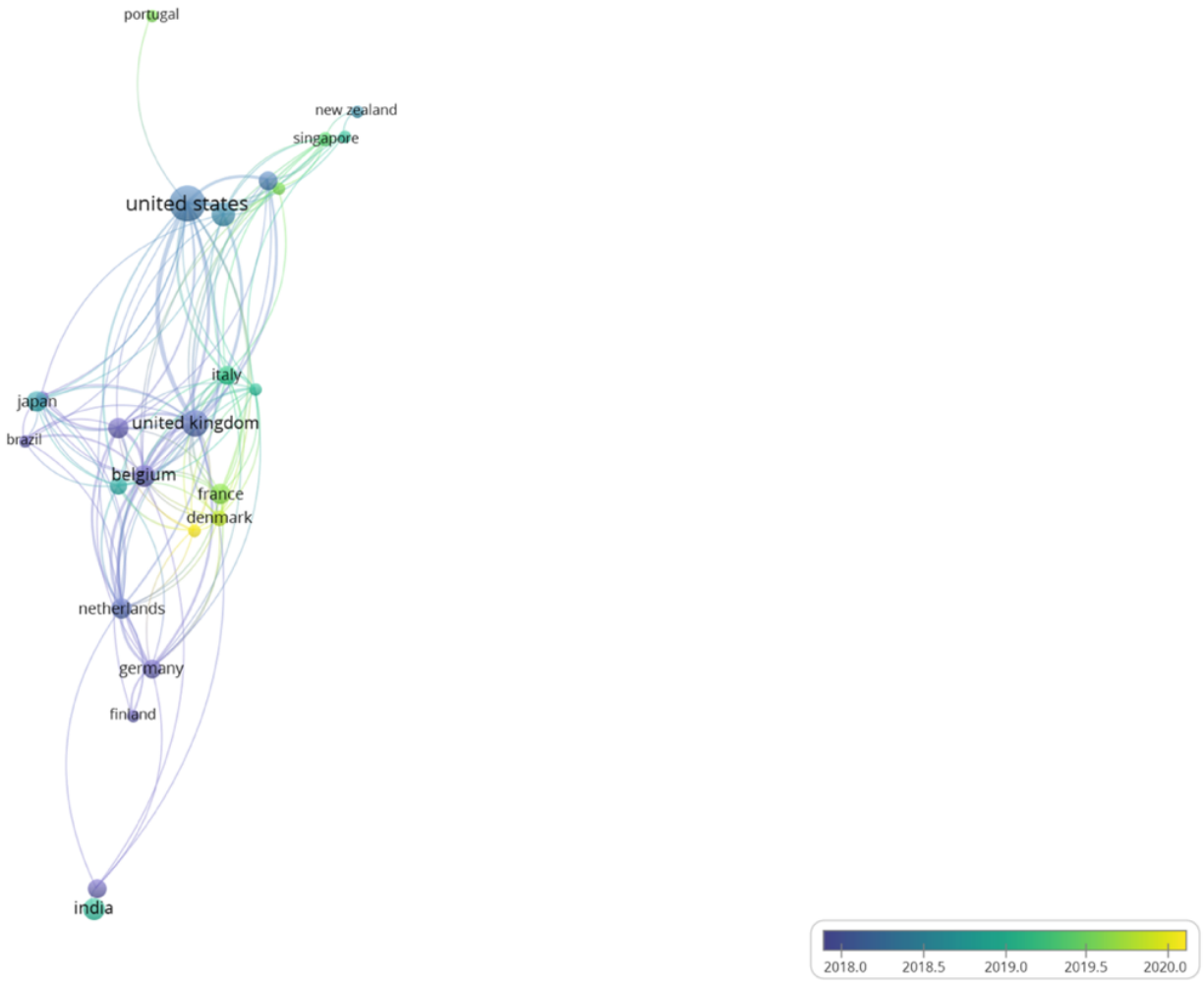


Figure 6– Average Publication Year (Source: VosViewer)

Table 7 was elaborated based on the number of documents. This way, the United States is first in this table, followed by the United Kingdom, which has a higher total link strength but a considerably low number of documents. The link in this table represents the relationship or connection between two elements. A positive numerical value indicates the strength of each link. In the representation of the active map, the link between two elements is shown as a thicker line, the greater the connection between them.

For instance, the link for the United Kingdom has a numeric value of 21, meaning there are 21 connections between the United Kingdom and other countries. In terms of average publication year, all the top 5 countries have relatively the same average. Still, based on each document, the United States has more recent publications than the remaining countries. However, the difference is so short that it is considered irrelevant.

Country	Cluster	Link	Total Link Strength	Documents	Average Publication Year
United States	5	19	49	64	2018
United Kingdom	1	21	55	23	2018
Belgium	4	18	39	13	2018
Netherlands	3	16	31	8	2018
Austria	4	16	30	9	2018

Table 7– Top 5 countries with higher Average Publications

The exact weight has been applied to documents in terms of average citations, with different scores. The outcomes are shown in figure 7. The top 5 countries with the highest rate of citations are the UK, USA, Belgium, Netherlands, and Austria. In terms of average citation rate, the closest the link is to yellow more citations the country has. The same occurs oppositely. The closer the link to blue, the fewer citations the country has.

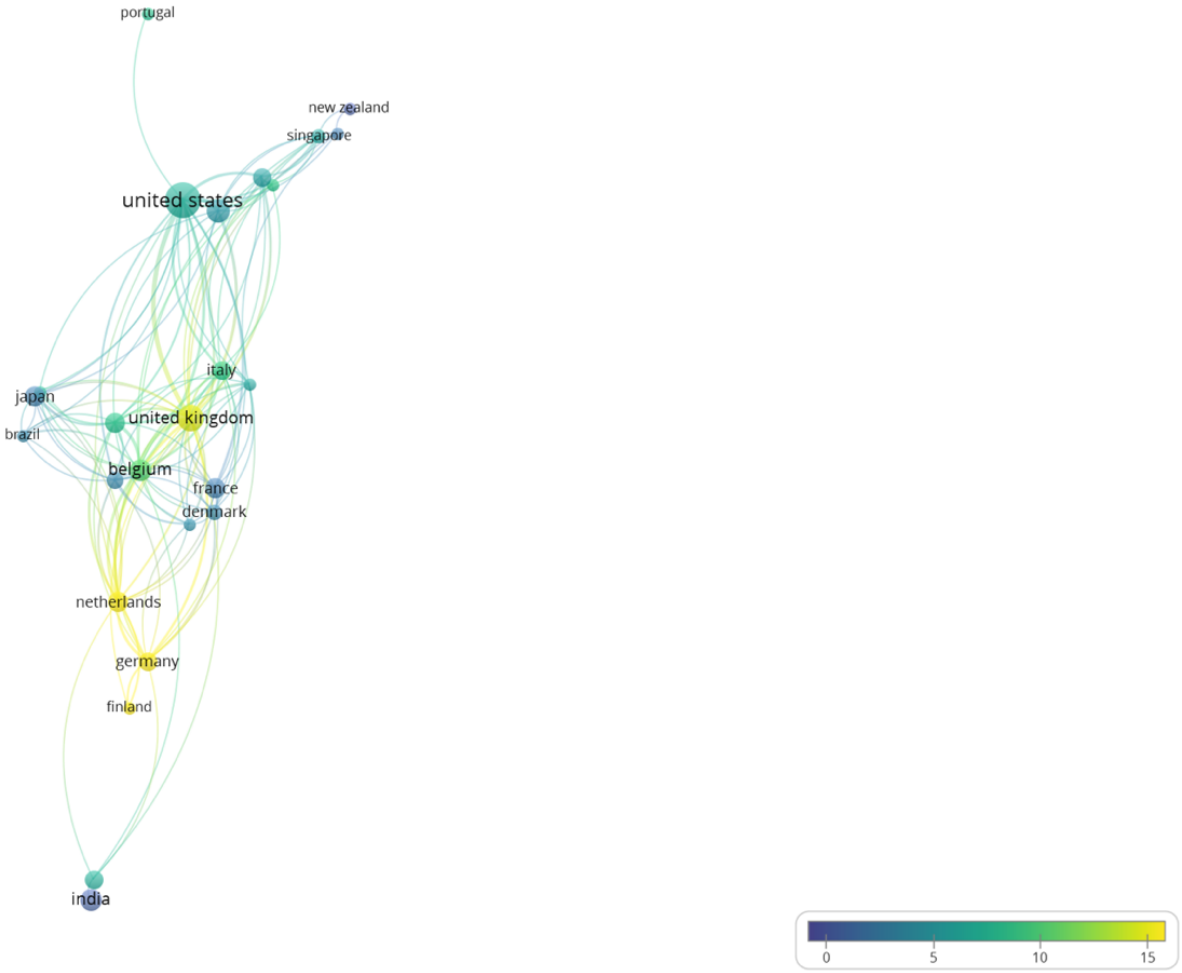


Figure 7- Average rate of citation (Source: VosViewer)

In table 8 is visible the ranked five countries with the highest average citations, with the United Kingdom overtaking Belgium with a considerably higher value, Germany in third, Netherlands in second, and Finland is in first with the highest average citations of all, overlapping the United Kingdom, Germany, and the Netherlands. However, Finland only has two documents and a very low link strength.

Country	Cluster	Link	Total Link Strength	Documents	Average Citations
Finland	3	3	5	2	39,50
Netherlands	3	16	31	8	18,62
Germany	3	13	20	7	17,00
United Kingdom	1	21	55	23	14,00
Belgium	4	18	39	13	10,08

Tabela 8- Top 5 countries with higher average citations

3.2.4 - Co-occurrence (All-keywords)

The query co-occurrence (All-keywords) presented in figure.8 has 6 clusters with 94 items. However, in the dataset, a total number of 1576 keywords were identified. But the threshold applied has defined 5 as a minimum number of occurrences per keyword. The output of this threshold was 94 items and 94 keywords with a minimum of 5 occurrences. Each cluster has a different number of items and the figure.8, show the mapped network, and the correlation between items, highlighting their similarities and differences. Each cluster has a suitable designation based on its keywords.

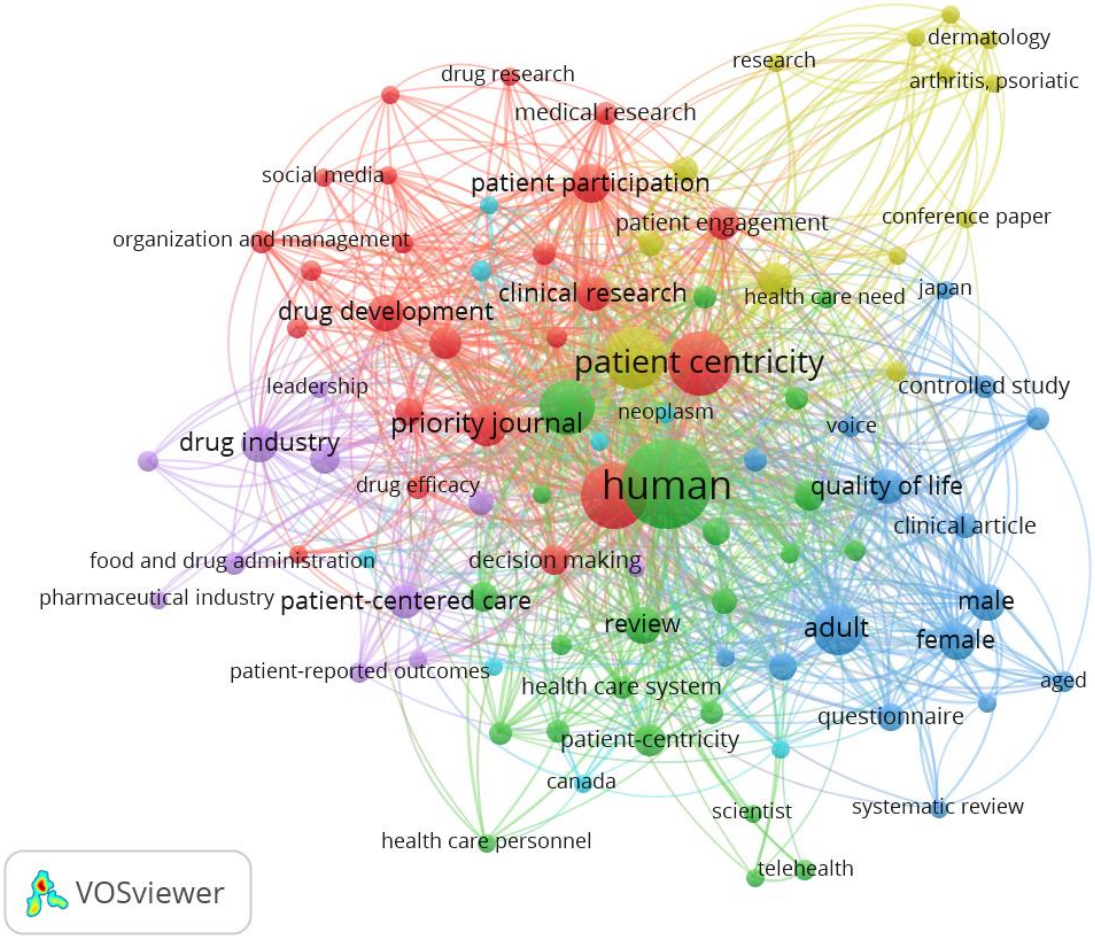


Figure.8- Keyword Occurrences (Source: VosViewer)

In the following table.9, the proper cluster designation and differentiation are highlighted and described. The most relevant keywords of each cluster are righted, and the colors and lines between the keywords create this incredible figure, dividing and grouping the keywords in clusters with different colors and degrees of importance. Vos

Viewer allows us to make this magnificent game of colors and keywords, facilitating the bibliometric analysis of this dataset.

Drug Development Cluster.1	Healthcare Conditions Cluster.2	Demographic Characteristics Cluster.3	Patient Conditions Cluster.4	Healthcare Convey Cluster.5	Healthcare Quality Cluster.6
Drug design; drug safety; organization and management; patient-centricity; patient engagement; investment	Follow up; comorbidity; healt care; patient-centricity; telemedicne	Adult; aged; female; male; quality of life; Japan; middle aged	Arthritis, psoriatic; dermatology; humans; psoriasis; rheumatology	Communication; drug industry; leadership; pharmaceutical industry; rare disease; trust	Ethics; Healtcare Quality; methodology; note; research design

Table. 9-Cluster Designation

Figure 9 highlights the occurrences of the top keywords. First is the keyword human with 112 occurrences. Followed by article with 63, the keyword patient-centricity is in third with almost the same occurrences, 60 occurrences. In fourth the keyword humans with 55, and in fifth with 42 occurrences, the keyword patient care. From a total of 1576 keywords obtained from 574 documents, these five are the most occurred. From all the documents of the dataset used and after the bibliometric analysis, the figure.8 and 9 adequately summarize the state of the art of patient-centricity.

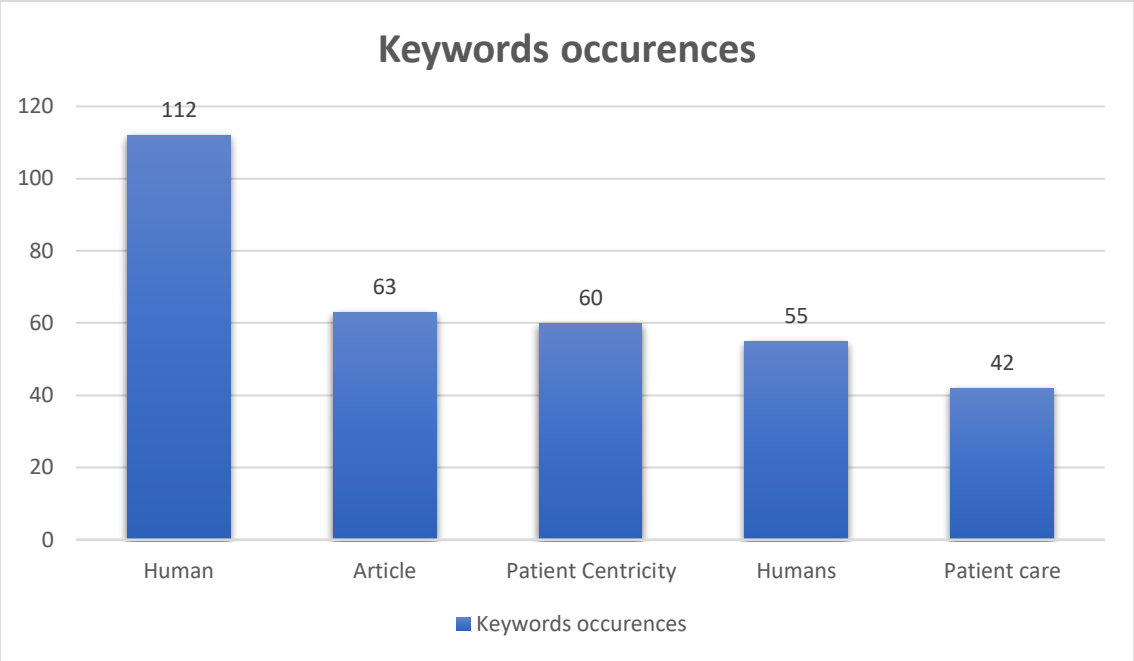
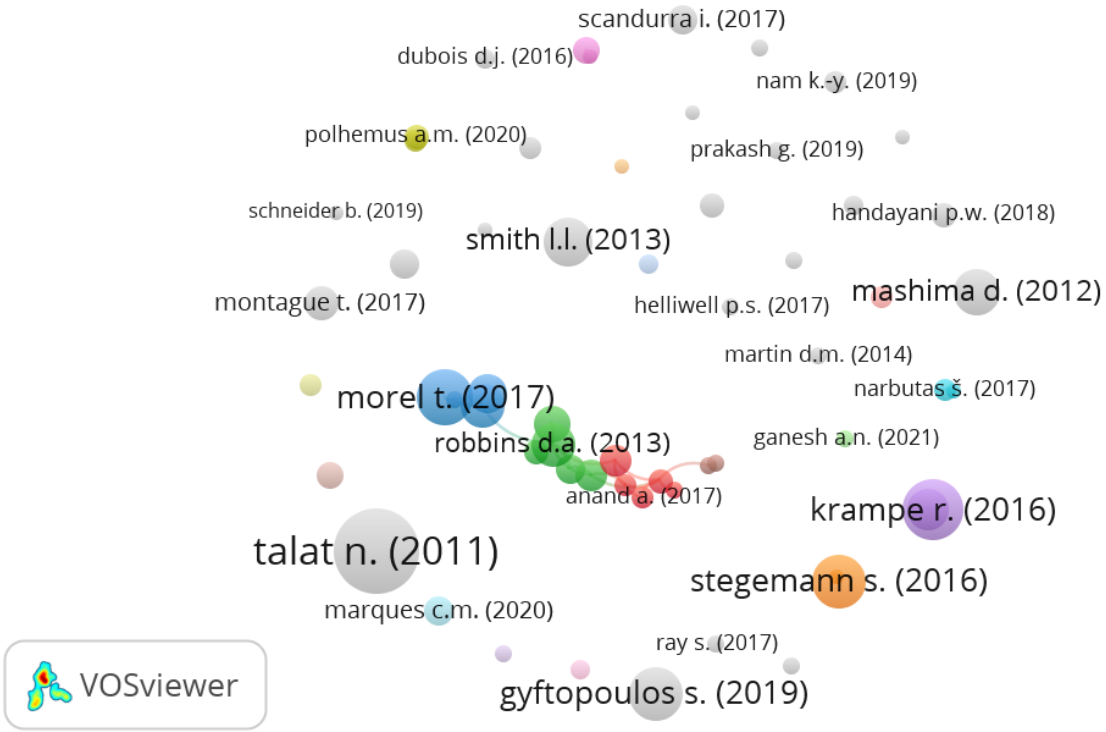


Figure.9- Keywords Occurrences

3.2.5 - Citation (Documents)



For the dataset citation-documents analysis, the applied threshold was a minimum of 3 document citations of all 154 documents. Only 77 documents fit in, for better

understanding, the mapped network shown in the figure.10 shows the results obtained from this search criteria. The articles most cited were analyzed, and further explanation of these articles will be made. Table.10 shows the article author and correspondent title.

Figure. 10- Citation (Documents) (Source: VosViewer)

Author	Document	Citations
Talat n.	Castleman's Disease: Systematic Analysis of 416 Patients from the Literature	108
Krampe. r	Oromucosal film preparations: points to consider for patient-centricity and manufacturing processes	53
Morel t.	Measuring what matters to rare disease patients – reflections on the work by the IRDiRC task force on patient-centered outcome measures	48
Stegemann s.	Defining Patient-Centric Pharmaceutical Drug Product Design	44
Gyftopoulos s.	Artificial intelligence in musculoskeletal imaging: Current state and future directions	44
Smith l.l	Integrative health coach Training: A Model for shifting the Paradigm Toward	35

	Patient-centricity and Meeting new national Prevention goals	
Mashima d.	Enhancing Accountability of Electronic Health Record Usage via Patient-centric Monitoring*	30
Yeoman g.	Defining patient-centricity with patients for patients and caregivers: a collaborative endeavour	29
Robbins d.a	Defining Patient-Centricity: Opportunities, Challenges, and Implications for Clinical Care and Research	27
Tian y.	Oromucosal films: from patient-centricity to production by printing techniques	26

Table. 10- List of most cited documents

The first and most cited article, with 108 citations, is slightly off-topic. The article evolves a systematic literature search and identifies 416 cases for detailed analysis. After reading the abstract the article was not considered.

The second article, "Oromucosal film preparations: points to consider for patient-centricity and manufacturing processes," already mentioned above in 3.3.1, Co-authorship (authors), has 53 citations, and the article highlights the relevance of

oromucosal film preparations forms in patient-centricity, oromucosal films are gaining increasing interest both as commercially available pharmaceutical products and extemporaneous preparations for personalized use (Krampe et al., 2016).

Following the table, comes the article "Measuring what matters to rare disease patients – reflections on the work by the IRDiRC task force on patient-centered outcome measures" with 48 citations. The article describes the struggle between rare disease patients and the implementation of a patient-centricity approach. A paradox is presented to these patients. First, most drug development programs for rare diseases rely on surrogate outcomes (e.g., laboratory measurements, organ size) that might not accurately reflect the treatment benefits that patients value, despite growing recognition that patients have the best understanding of the health outcomes that matter. Second, while efforts have been made to speed up and intensify research into rare diseases because of patients' calls for new treatments (as evidenced by the rise in orphan designations granted by regulatory bodies), obtaining regulatory approval and the vitally important reimbursement of new therapies for rare diseases is becoming more and more challenging. This because there isn't evidence that patients' actual health outcomes have improved (Morel & Cano, 2017). Thirdly, recurrent late-stage drug development program failures have increased discontent with traditional results measurements. Despite the recorded typically high success rates in clinical trials for treatments of uncommon diseases. The inability to demonstrate the statistical significance and substantial benefit is at the heart of these failures (Morel & Cano, 2017). This lack of agreement over the most crucial outcomes to research is currently causing delays or refusals in patient access to novel treatment alternatives. This is all very annoying, but most significantly, it creates the potential to act in the case of severe, terrible, progressing, and terminal diseases, where less than 5% have an approved treatment. To encourage international research collaboration and investment in the field of rare diseases, the International Rare Diseases Research Consortium (IRDiRC), an initiative launched in 2011 by the European Commission and the US National Institutes of Health, decided to create a specialized Task Force on Patient-Centered Outcome Measures (PCOMs), (Morel & Cano, 2017). The conclusions were clear, creating patient-centered outcome measures for rare diseases, as noted in the article, is a necessity.

PCOMs are unique because they 'directly' quantify the effect of an illness and its treatment on patient-important health outcomes. They are instruments developed with patients' inputs as a prerequisite and with the critical ideas of interest (i.e., how patients survive, feel, or function) in the foreground. PCOMs encompass all varieties of clinical outcome assessments and are not just restricted to self-report instruments. PCOMs ought to be fit for purpose at all times. Simply said, they should collect data from the appropriate patients and measure the proper outcomes (those corresponding to patients' preferences, expectations, and values as they deal with their daily sickness). (Morel & Cano, 2017).

Most rare diseases have no PCOMs. However, they eventually present the chance for a more accurate and understandable assessment of patient benefits.

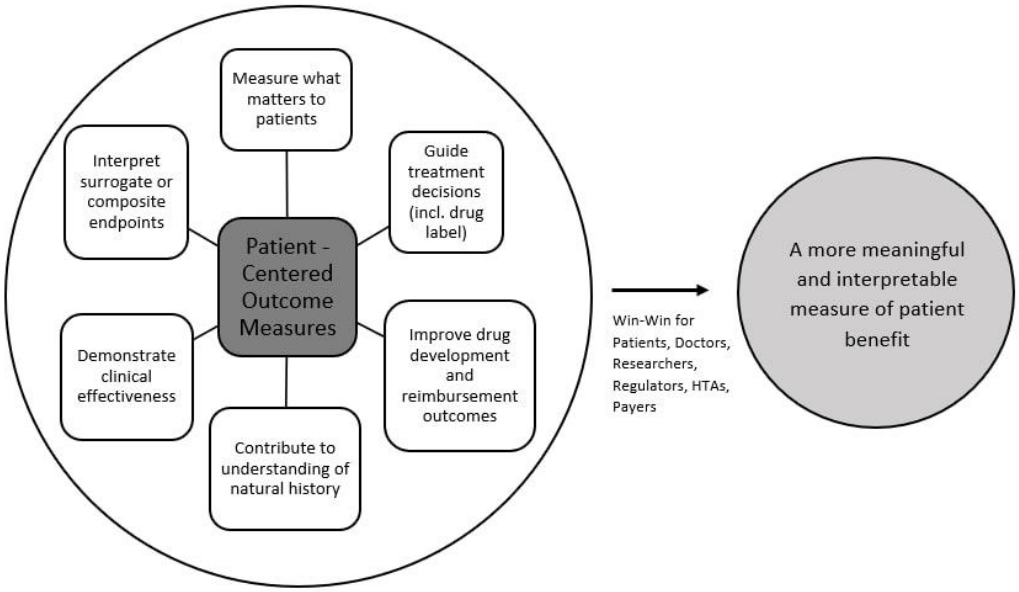


Figure.11-PCOMs (Morel & Cano, 2017)

PCOMs are beneficial to all parties involved in healthcare. All parties involved in the healthcare system can benefit from evaluating value from the patient's point of view. PCOMs assist in converting care and observable treatment effect into an interpretable measure of patient benefit since they are based on what matters most to patients. PCOMs may be used as efficacy endpoints in clinical studies, outcome measures in registries, therapeutic decision aids for routine care, or tools to monitor care delivery, among other things. (Morel & Cano, 2017).

All possible data sources and routes should be investigated to get over the constraints of our scant current understanding of uncommon diseases. The patient and caregiver's

experience of having a rare disease must first be mapped out through qualitative research, which is an essential initial step.

Consider every possibility, as this is crucial. Among the methods widely used in PCOM research, the following are just a few:

Pre-trial concept elicitation patient interviews go into great detail to enable a thorough examination of the disease experience, including an analysis of the most prominent symptoms and the overall impact of the disease on everyday life. In-depth information on how patients define improvement and treatment benefits can be gained via interviews conducted as part of clinical trials, such as study departure interviews or the so-called subject experience interviews spaced out across an investigative trial. Focus groups give patients a forum to converse and contrast their experiences, internet and social media usage, direct observation enables researchers to follow patients as they go about their daily lives to understand firsthand what it's like to suffer a rare disease. To produce rich data, this technique can be used in conjunction with patient interviews and audio/written diaries to give people with rare diseases a quick way to record their experiences (Morel & Cano, 2017).

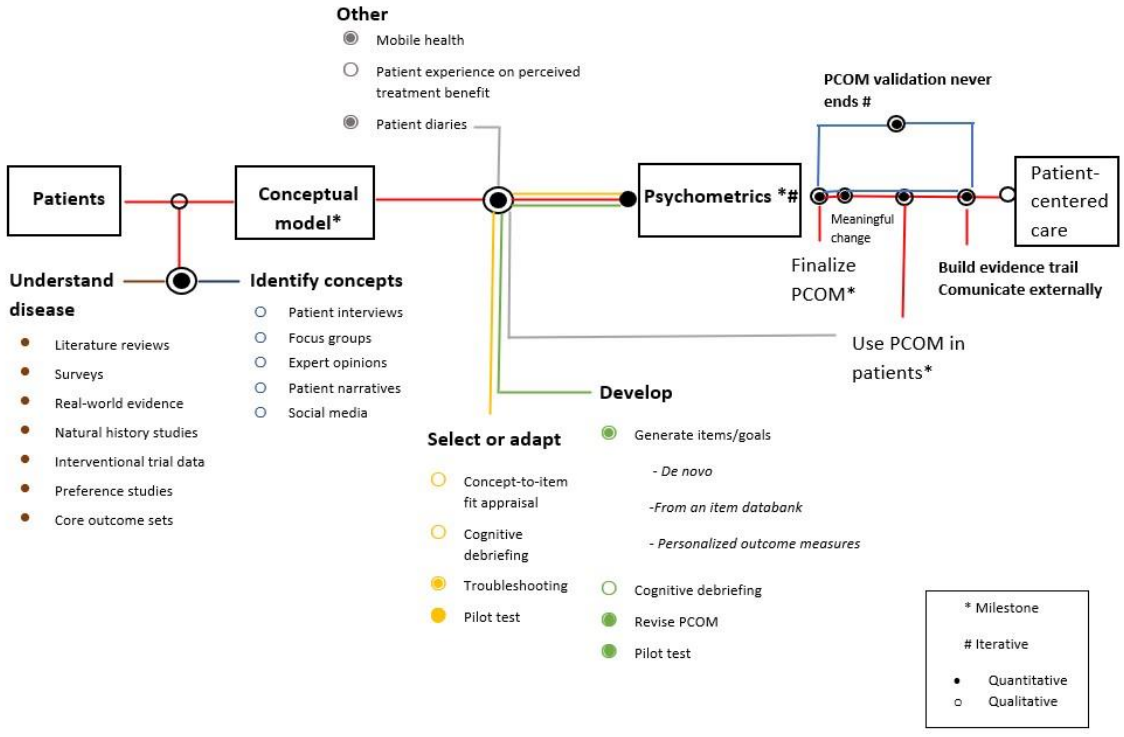


Figure.12- 'On track' to Patient-Centered Outcome Measurement (Morel & Cano, 2017)

PCOMs should be based on patients' daily experiences with the rare disease and on their core ideas, expectations, and values to be effective and give valuable information. Developing PCOM strategies is an iterative process where qualitative and quantitative patient evidence complement one another to establish the results that matter most to patients. As a result, we always begin our journey with the patient (far left of the diagram), and before moving on, we ensure that we fully comprehend the ailment and essential concepts (Dark Blue and Brown lines). It can take more than one cycle to get this right. Following this, the anchor remains the same: patients and the conceptual model, regardless of whether one chooses to select/adapt an existing outcome measure (Yellow line) or to construct a novel PCOM (Green line). Because rare diseases are uncommon and complex, imagination and realism should rule. This could include different methods for gathering information (Grey line). In the end, as we move closer to our goal (patient-centered care), we must make sure that our PCOMs are completed (light blue line) so that we can start to develop an evidence base for its use (Morel & Cano, 2017).

A PCOM's usefulness depends on its capacity to accurately assess a treatment's effects and convey those findings to patients and other stakeholders.

To conclude, rare disease medicines should be created to treat persons, not simply their disease. Therefore, we must be able to evaluate outcomes that benefit patients. However, clinical research and practice today are not quite there. To encourage the creation and application of Patient-Centered Outcomes Measures (PCOMs) to support the achievement of Patient-Centered Care across all rare diseases, a multi-stakeholder partnership should arise, with the community of patients with rare diseases at its core.

The next article in the table. 10 is "Defining Patient-Centric Pharmaceutical Drug Product Design." The article has 44 citations. Due consideration must be given to the pharmaceutical drug product design when choosing the suitable drug substance and strength for a specific indication in a particular patient, i.e., ensuring adequate patient adherence and the anticipated drug safety and effectiveness (Stegemann et al., 2016).

Pertinent pharmaceutical design elements include the choice of administration route, tablet size, and form, package opening simplicity, user instructions' readability, and compliance with suggested (in-use) storage conditions. There is currently no agreed-upon definition of patient-centric drug development or design. It is essential to create a

definition for patient-centricity. This paper presents the findings and aims to spark additional talks with all parties concerned to develop a standard definition of patient-centric pharmaceutical therapeutic product design that can be applied to all relevant disciplines (Stegemann et al., 2016).

People are continuously at risk of developing chronic diseases affecting their lives. Every disease can occur at any life stage, either alone or in conjunction with others, nowadays, and the years of accumulated knowledge allow the creation of an infinity of new drug therapies and the overall growth of life expectancy. There are more and more types of unique patient populations due to improvements in pharmacology, hygiene and healthcare that have generally increased life expectancy. There are different groups of patients. Some are more fragile than others and depend on caregivers to manage their medications. A pharmacological product that addresses patients' demands in the real world is likely to be produced by anticipating the patient features of the target patient population and its subgroups at the time of product design and initial development, leading to an enhanced therapeutic outcome (Stegemann et al., 2016).

Currently, the phrase patient-centricity is employed in a variety of contexts, including the design and execution of clinical protocols, communication with patients through digital platforms, exchange forums, or marketing, mention of patient monitoring or support systems, and the description of pharmaceutical products made to specifically address the needs of specific patient populations and individual patients (Stegemann et al., 2016).

A proper definition of patient-centric pharmaceutical drug product design is needed, so a proposed definition was settled for this definition, the design of the comprehensive presentation of the therapeutic entity to the end user (patient/caregiver/ health care provider), including the type of dosage form, formulation, dose, dosing frequency, primary, secondary, and tertiary packaging, medical device, dosing devices, instructions for use (as in the SmPC/PIL/ product label) and other authority-approved patient support tools and programs. Already for patient-centricity, a definition was also created, the recognition of the needs of a patient or distinct patient population and their specific needs as the focal point in the overall design of medicine, including the targeted patients' physiological, physical, psychological, and social characteristics. And finally, for patient-centric pharmaceutical drug product design, the process of identifying the comprehensive

needs of individuals or the target patient population and utilizing the specified needs to design pharmaceutical drug products that provide the best overall benefit to risk profile for that target patient population over the intended duration of treatment (Stegemann et al., 2016).

This article concludes that to create high-quality patient-centric medication products, it will be crucial to test the design of the therapeutic product with the targeted patient population in their health and environmental context (Stegemann et al., 2016).

Using the relevant patient and illness state attributes and being aware of the anticipated therapeutic outcomes, the product designer or developer can identify the logical design drivers. These design principles result from a deep understanding of the target patient group and can be connected to particular design outputs unique to the following therapeutic product (Stegemann et al., 2016).

The idea of patient-centricity aims to consider all aspects of product design that may impact or directly address the unique demands of the target patient population. Age, comorbidities, and functional restrictions at different stages of the disease are only a few examples of known patient characteristics that might be used to generate these components. (Stegemann et al., 2016).

A user-centered product design of the portfolio of drug products, which is based on a prediction and subsequent evaluation of the interface of the patient or caregiver with the product that is primarily intended to serve the needs of this patient, aims to reduce medication errors while improving the effectiveness of the medication. The current publication can be a starting point for additional conversations between the concerned parties. It might also emphasize the importance of adequately educating patients, caregivers, and medical professionals on the properties of the drugs in the drug portfolio and the benefits and drawbacks of using each (Stegemann et al., 2016).

"Artificial Intelligence in Musculoskeletal Imaging: Current Status and Future Directions" is the name of the following article, with 44 citations. This article describes the value that artificial intelligence (AI) has in the present in different areas and the future advantages that it will bring.

AI might dramatically impact each step in the imaging value chain. Several kinds of research involving musculoskeletal (MSK) imaging have previously examined and demonstrated the potential utility of AI at the current early stages of radiology. This article introduces AI to MSK radiologists by reviewing recent research demonstrating how it is used at various phases of image creation and utilization (Gyftopoulos et al., 2019).

Every link in the imaging value chain might be significantly improved using AI. By enhancing image quality, patient-centricity, imaging efficiency, and diagnostic accuracy, AI can increase the value that musculoskeletal imagers provide to their patients and to referring clinicians, from assessing the appropriateness of imaging orders to assisting in the prediction of patients at risk for fracture (Gyftopoulos et al., 2019).

Following the articles in table 9, we have the article "Integrative health coach Training: A Model for shifting the Paradigm Toward Patient-centricity and Meeting new national Prevention goals." This article was cited 35 times. One current healthcare problem in the United States is primarily caused by chronic diseases linked to lifestyle choices, resulting in a significant disconnection between patient behavior and healthcare practitioner recommendations. There is an urgent need for an allied health practitioner tasked with enhancing patient engagement and activation who is adept in the art of eliciting sustainable changes in health-related behavior. The Integrative Health Coach Professional Training (IHCPT) program at Duke University was created for this reason, along with a growing number of additional professional training programs (Smith et al., 2013).

A need for greater consumer access to high-quality medical care sparked the development of a new allied healthcare profession, the physician assistant (PA). New ways to stop this are needed with the healthcare system's complexity and challenges. Chronic diseases are increasing, and comorbidities are also on the rise. With all this, advances in healthcare costs are inevitable. There are flaws in the healthcare system that contribute to this chronic disease epidemic.

First, the design of our existing healthcare delivery system, particularly its reimbursement structure, strongly emphasizes managing disease episodes rather than using foresight, planning, and disease prevention (Smith et al., 2013).

Second, the medical profession frequently fails to capitalize on scientific advancements, particularly the growing amount of evidence that indicates how important lifestyle factors are in the emergence of most chronic diseases. Numerous lifestyle factors, including inactivity, the Western diet, smoking, and a chronic stress reaction, have been linked in studies over many years to an elevated risk for severe illnesses and death. As a result, the current system does not meet the need for a mechanism for successful. Sustained patient engagement and activation are crucial components of chronic disease prevention. (Smith et al., 2013).

Critical functions of IHC present tenable solutions to the three flaws in the current system: cultivation of foresight for proactive health planning, focus on lifestyle, and a high degree of personalization, clarifying each person's vision, values, and linked goals while addressing internal and external obstacles to success (Smith et al., 2013).

In summary, IHC is a quickly developing health coaching brand with preliminary solid data pointing to its usefulness in battling lifestyle-related illnesses. A broader use of IHC could accelerate the trend toward empowering people to take control of their health, given the current challenges in healthcare and how it coincides with declared national preventative goals. All parties involved in the public and commercial healthcare sectors would gain from any potential decrease in the prevalence of chronic illnesses and the resulting reduction of associated morbidity, mortality, psychological burdens, and financial costs.

The seventh most cited document, "Enhancing Accountability of Electronic Health Record Usage via Patient-centric Monitoring," is cited 30 times.

Systems such as Personal Health Records (PHR) and Electronic Health Records (EHR) could assist patients in sharing and managing their health information more effectively, which would enhance the efficacy and standard of their medical care. Unfortunately, patients may face new risks if information from EHR and PHR systems is misused. Patients should have the tools they need to protect their health information to prevent issues like medical identity theft. This paper describes the accountable usage and updating of electronic health records and then constructs your monitoring system on it (Mashima & Ahamad, 2012).

To improve accountability in health record sharing, the authors proposed a patient-centric monitoring system and related guidelines for health record updates and usage in this work. The plan improves patients' awareness of and controls over their health records by integrating with common EHR/PHR systems and NHIN (National Health Information Network) (Mashima & Ahamad, 2012).

Direct, a developing standard for health record sharing. They also demonstrated that accountability might be delivered with minimal overhead by presenting a prototype implementation in the NHIN Direct environment (Mashima & Ahamad, 2012).

A patient-controlled monitoring agent's functionality will be improved as part of future development. For instance, a strategy for anomaly identification based on information about observed usage or updates will lessen the load on patients to review log records. A user-friendly log visualization would also be helpful. They will investigate standard healthcare workflow to create efficient anomaly detection strategies that could help patients to manage better and share their health information to improve the effectiveness and quality of their medical care (Mashima & Ahamad, 2012).

Continuing the sequence of most cited documents, we have a document cited 29 times, "Defining patient-centricity with patients for patients and caregivers: a collaborative endeavor."

The therapy for diseases and the research/development of biopharmaceutical therapies both require active patient participation. A thorough grasp of patients' medical problems, experiences, needs, and priorities is necessary to improve their quality of life. There isn't a single definition of patient-centricity, though. A few initiatives were carried out to define patient-centricity and its fundamental tenets that affect the biopharmaceutical sector (Yeoman et al., 2017).

Utilizing a patient-centric approach while developing new medications gives researchers a chance to understand patient requirements better and, as a result, improve patients' lives in ways that patients and their families find valuable (Yeoman et al., 2017).

The idea of patient-centricity and the chance to include patient-centered activities in drug development has drawn significant attention in recent years. Progress has been made in parallel with important stakeholders such as industry, regulators, and healthcare

professionals. Patients also call for more significant patient-centric drug development and patient-centric relationships to be established (Yeoman et al., 2017).

To define patient-centricity and its fundamental concepts, AstraZeneca performed a thorough, varied research effort across critical stakeholders for this article. The goal was to uncover significant issues for patients, healthcare providers, and payers (Yeoman et al., 2017).

The values and issues considered most important are:

Education and information: Patient advocates and stories, helping patients manage their health and make their own decisions. Resources for families, careers, and communities, resources for healthcare professionals, collecting patient views, and providing information about side effects (Yeoman et al., 2017).

Cocreation: Research patient needs more broadly, collaborate with patients and other stakeholders to promote policies that will benefit patients, and collaborate with patients and other stakeholders to co-design solutions. Work with patients and other stakeholders throughout the research, development, and launch of medicines (Yeoman et al., 2017).

Access: Patient assistance program, flexible pricing policy, and support service to aid patients in navigating complicated health systems and concerns (Yeoman et al., 2017).

Transparency: Transparency with clinical trial data, when developing medicines, reporting on the measurable patient benefit and patient safety, responding to patients' feedback—showing how you have listened, open and accountable reporting of progress, values-based approach to business development (Yeoman et al., 2017).

Patient-centricity is essential in creating new media and value-based healthcare management. Since patient involvement affects health outcomes, the biopharmaceutical business must collaborate with patients in drug discovery, development, distribution, and access. Patients and industry leaders from AstraZeneca collaborated to develop a consistent definition of patient-centricity and its guiding principles for the biopharmaceutical sector. Biopharmaceutical companies need to adopt this definition and the fundamental principles. To achieve demonstrable and beneficial improvements in

patient outcomes by applying the concept and guides throughout the medication discovery and development process and beyond (Yeoman et al., 2017).

The patient-centric program's overall goal is to meet patients' needs and provide them the power to establish connections with their healthcare providers, their community, and other patients. It is meant to be dynamic, scalable, and sustainable as patient interaction increases. Ultimately, it is intended to improve patients' lives in a quantifiable way. An iterative method incorporating patient insight can start in the early stages of medicine development and continue throughout the entire drug development. In conclusion, the authors co-developed a concept of patient-centricity and essential principles for patient engagement, offering biopharmaceutical businesses the chance to adopt and use these characteristics as a benchmark for patient involvement throughout the product life cycle (Yeoman et al., 2017).

With 27 citations, we have the article "Defining Patient-Centricity: Opportunities, Challenges, and Implications for Clinical Care and Research ".

This article aims to investigate the definition of patient-centricity, the difficulties and drawbacks of incorporating the idea into clinical research and patient care, and its effects on patients, providers, and healthcare systems. Clinical research must use operational parameters to be patient-centric, ultimately impacting healthcare expenditures (Robbins et al., 2013).

The article brings the patient viewpoint to clinical research design, and the outcomes investigated are the responsibility of the Patient-Centered Outcomes Research Institute (PCORI), which was established and supported by the Affordable Care Act. There is no widely accepted definition of patient-centeredness or patient-centricity, though. This essay distinguishes the two and outlines a framework for the patient-centricity idea. It is necessary to define the patient's involvement in clinical research in a way that makes it practical to apply health care delivery and support guidelines over an extended time. The authors suggest using a structured Practice-Based Clinical Research Network to conduct patient-centered outcomes research following the demands of the pharmaceutical industry in a safe, morally responsible, and efficient manner that is also consistent with the principles of Good Clinical Practice (GCP) (Robbins et al., 2013).

The patient-centric approach presents both opportunities and difficulties. It opens the topic of patients having the power and duty to decide in their best interests to enable patient-centricity. This paradigm necessitates the development of the necessary skill sets for patients, physicians, and other caregivers. Participation from the patient is not a privilege. It is expected. At the same time, we must decide if society should bear the expenses of foolish choices made by those who made terrible predictions of expensive events and neglected to obtain proper financial safeguards and defenses (Robbins et al., 2013).

In terms of how far caregivers are prepared to buy into an unfettered centricity, this will probably raise some clinical eyebrows and could have a chilling impact or backlash. Creating a centralized health information system is still in its formative phases. The capacity and logistics of how patients use the system and acquire influence over healthcare decisions will need to be improved and rethought, as well as how doctors and other healthcare professionals should support patient initiatives to maximize their involvement and participation. Adopting centricity won't give patients the resources and medical knowledge they require to be centric. Like patients, not all healthcare professionals may adopt a centered stance (Robbins et al., 2013).

At the point of care and the system level, it's crucial to address the opportunities and limitations of centricity and pinpoint immediate structural supportive improvements, for this will necessitate significant adjustments to how patients and healthcare professionals at all levels are educated. This approach could result in a cost-effective, high-quality, effective, and patient-centered healthcare system (Robbins et al., 2013).

The last document of the table, with 26 citations, is the document "Oromucosal films: from patient-centricity to production by printing techniques," which describes the shift in the production techniques of oromucosal films, comprising mucoadhesive buccal films (MBFs) and Orodispersible films (ODFs) from conventional solvent casting to printing techniques, these dosage forms are considered patient-centric, and the target group is patients with special needs. Regarding patient acceptability, oromucosal films are regarded as patient-centric dose forms. According to the European Medicines Agency (EMA), patient acceptance refers to a person's capacity and willingness to use medication as directed. Patient acceptability has become a critical factor, influencing therapeutic product development and ensuring adherence to medical therapy and reducing medication

errors. It is possible to administer them without oromucosal films in patient groups with unique needs thanks to qualities including ease of handling and transportation, thinness and flexibility, dose flexibility, and the presence of just a little water (Tian et al., 2019).

The small amount of drug load that can be contained is a significant barrier in oromucosal film fabrication. Increasing the film's surface area or thickness is a reasonably easy way to enhance the drug load. However, this can hurt the patient's acceptance. The use of multi-layered oromucosal films is an additional choice. The solvent casting technique, for instance, can be used to create these films. The solvent casting process is still the most popular oromucosal film preparation technique. In essence, an appropriate solvent is used to dissolve all of the excipients (usually water). The remedy is cast, dried, and then sized to the required shape. Recently, printing methods for creating oromucosal films have been suggested. Oromucosal films are a group of patient-centric dose forms appropriate for individuals with particular needs. The dosage form's design can be improved for patient acceptability. User-friendliness, disintegration time, and stickiness are crucial factors in patient acceptance. ODFs typically treat systemic ailments, whereas MBFs treat systemic and local disorders (Tian et al., 2019). Companies' internal patient-centeredness is a reality and a very apparent potential for them to differentiate themselves from competing businesses. (Tian et al., 2019).

3.2.6 - Citation (Sources)

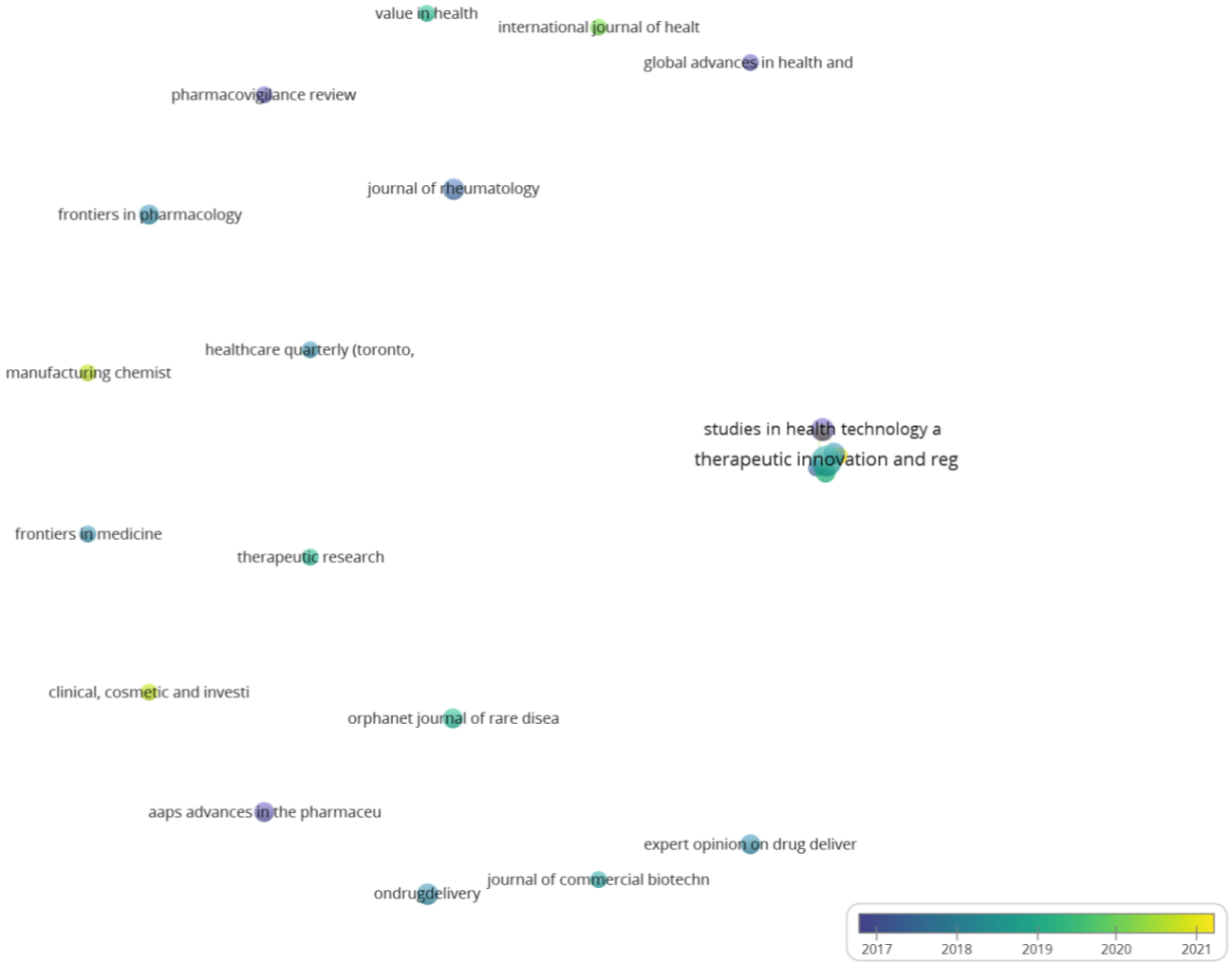


Figure 13- Sources with more citations

The final dataset analysis is the query citation sources. The threshold applied in this dataset analysis was a minimum of 2 documents per source. Of the 103 sources identified in the dataset, only 23 meet this threshold, and most of the items are not connected to each other. The first 3 clusters are connected and are the most extensive connections. The visualization of all 23 items is visible in figure 13.

This dataset shows the most relevant sources of information for the data set of patient-centricity. These sources are the base of the dissertation information.

The importance and weight of the source “therapeutic innovation and regulatory science” and “studies in health technology and informatics” are visible, and the connections between them and all the items in the first 3 clusters. The following table ranked the items based on their documents and citations. The table.11 is composed of 7 sources with the highest number of documents and citations.

Source	Documents	Citations
Therapeutic innovation and regulatory science	16	83
Studies in health technology and informatics	5	32
Clinical Therapeutics	4	36
International journal of pharmaceutical and healthcare marketing	3	9
Current oncology	2	1
Pharmaceutical medicine	2	1
Jmir mhealth and uhealth	2	22

Table 11-Sources with more published documents

Table 11, top 7 sources with more published documents. The first source of the table is “Therapeutic innovation and regulatory science,” which is a journal, and all the documents are articles, just like most documents available about patient-centricity.

Is incontestable the importance of the journal Therapeutic innovation and regulatory science for State of the Art, and many of the articles about patient-centricity came from this source.

“Studies in health technology and informatics” is the second source with more published documents, but the type of documents for this are conference papers and book

chapters. For a better understanding of how the information from the different sources is divided, a statistical analysis of the type of documents is needed, and the following table describes that.

Source	Article	Conference Paper	Book Chapter
Therapeutic innovation and regulatory science	16	0	0
Studies in health technology and informatics	5	3	1
Clinical Therapeutics	4	0	0
International journal of pharmaceutical and healthcare marketing	3	0	0
Current oncology	2	0	0
Pharmaceutical medicine	2	0	0
Jmir mhealth and uhealth	2	0	0

Table 12-Types of sources

Most of the source types are articles. Now, at the beginning of 2023 is impossible to be sure of how many of the five articles from Studies in health technology and informatics

are, in fact, articles, book chapters, or conference papers. However, proximal quantifications were made. It is also important to mention that new articles are being published daily, and only the database from the beginning of 2022 was considered.

In September 2022, 587 documents were published related to patient-centricity, and from these, 493 are articles. Articles are the basis of information for patient-centricity. However, other documents are essential for the state-of-the-art, like conference papers, book chapters, reviews and notes. A summary representation is illustrated in the next figure 13.

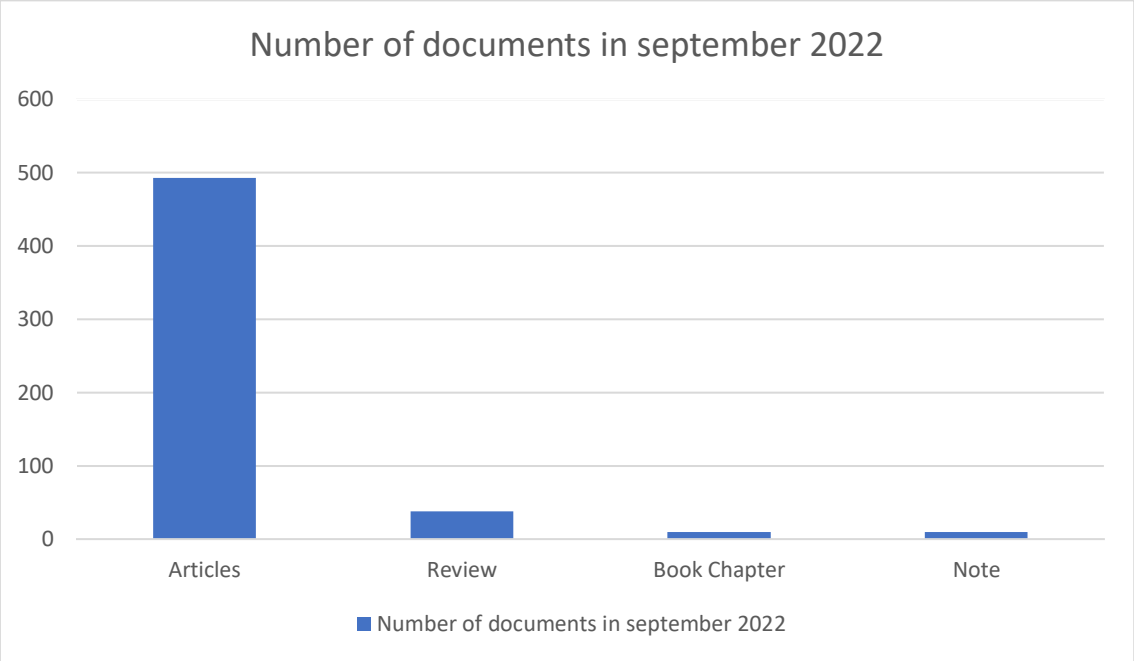


Figure.13-Types of sources used

Figure.14 shows the types of subject areas of the SCOPUS dataset. Being medicine the highlight of subjects by far, being the topic so intimate and related to health is understandable. Is clear that business, management, and accounting are a niche with a long way to go, regarding the connection with this theme.

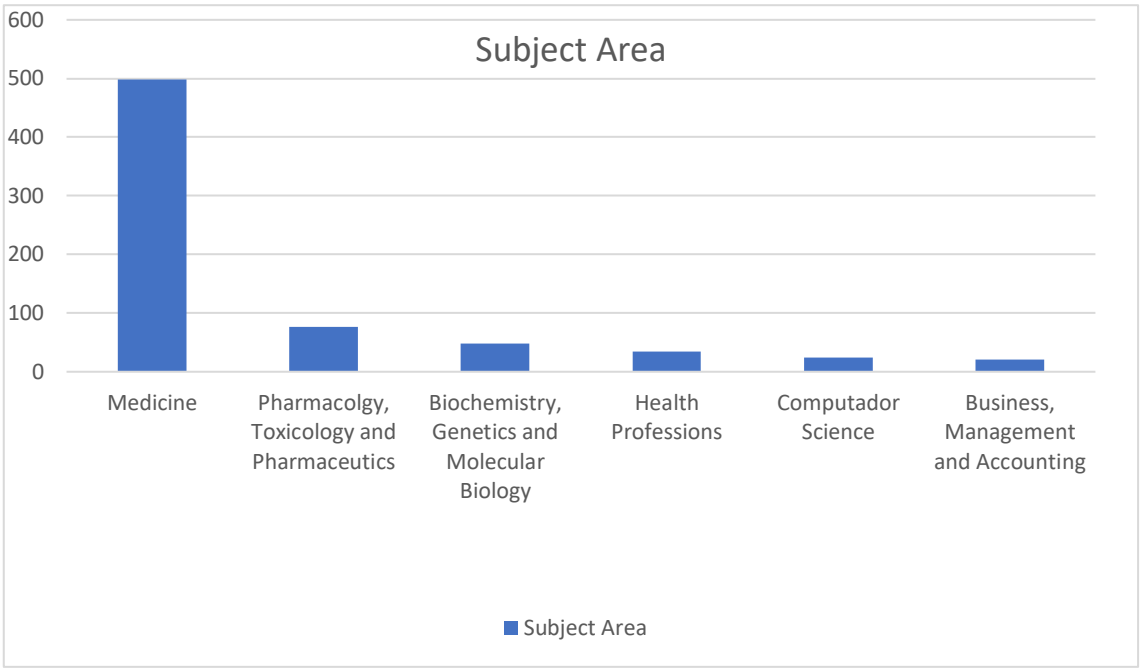


Figure.14-Types of subject areas of the Scopus dataset

CHAPTER 4

Discussion of results

Patient-centricity is a topic with much to be told, especially in the future. There are hundreds of documents related to the subject, as the above results have shown. The topic is divided into different areas. Of all the documents used, the field of medicine is the one with more documents. Pharmacology, toxicology, and pharmaceuticals are next. The area of business, management, and accounting is poor on this topic. Being patient-centricity so intimately related to health itself is expected to be the medicine and the health science topics the central of research.

Patient-centricity is a recent topic that has been talked about, but only recently gained relevance. Until the beginning of the 21st century, there were only some articles related to patient-centricity, but with little relevance. It was in 2006 that the number of documents started to increase. Between 2006 and 2009, the number of published documents per year was constant. However, a relatively low number of documents were published. The topic had little relevance. It is then, from 2010 onwards, that the number of articles began to rise, with dozens of articles being published annually about patient-centricity, in part due to the natural evolution of medicine and the need to adopt new measures throughout the life cycle of the drug, also the population growth, and the need for a rethinking of the business ideology of pharmaceutical companies, hospitals, and the entire healthcare supply chain.

The market conditions also changed. There are fewer blockbuster drugs and more rigid quality control, and the generics, hybrids, refined pharmaceuticals, and me-too versions are emerging and have been in constant development. The healthcare operating landscape is in adjustment (Marques et al., 2020).

Along with market and political dynamics, scientific and technological advances have paved the way for new directions in the pharmaceutical sector and threatened its established business model (Marques et al., 2020).

From 2021 onwards, an explosion occurred in the number of published articles, reaching the mark of hundreds of articles published. One probable reason was related to the Covid-19 pandemic and the search to become patient-centric, becoming more focused on the well-being of the patients.

There are hundreds of documents about patient-centricity. As mentioned above, 574 documents were considered for this dissertation. From this data set, the most vibrant authors are Breitkreutz, Frijlink, Visser, and Woerdenbag. All were cited 79 times and have two documents in common about the importance of oromucosal film preparations from a view based on the patient. And the most cited document was "Oromucosal film preparations: points to consider for patient-centricity and manufacturing processes," with the four together with Raphael Krampe as co-authors. The most cited documents are related to the pharmaceutical business and the type of drug development program that best reflects benefits to the patient. The medicine should cure not only the disease but also the person. Patient-centricity considers all aspects of product design that may impact or directly address the unique demands of the target patient population (Stegemann et al., 2016). Patient-centricity is directly related to the pharmaceutical business and to the business management of these companies.

The pharmaceutical business is essential to the healthcare system. It has profited for many years from a business model focusing on discovering and developing profitable pharmaceuticals (blockbuster drugs). However, in recent years, the market conditions for pharmaceutical companies have changed, like mentioned above there are fewer blockbusters, more specialized and individualized drug goods, stricter quality control, increasing competition from me too products and generics, and more global and geographically scattered markets (Marques et al., 2020).

Patient-centricity is projected to accelerate productivity, decrease drug development cycle times, and spread R&D costs and risks among several cooperating parties. Engaged patients and their network of healthcare advocates will assist sponsors in making clinical trials more feasible, accelerating patient recruitment and retention efforts, and gaining support from crucial and secondary stakeholders in the development of new medicines and their commercialization (Kenneth Getz, 2015).

Along with market and political dynamics, scientific and technological advances have paved the way for new directions in the pharmaceutical sector and posed a threat to its established business model. Most companies still focus on the traditional model, with a sales force as its core. Patents expiring, generic medications entering the market with component equivalents, and a reduction in new unique chemicals in research pipelines

mean that pharmaceutical goods are becoming interchangeable. (Christoph Burmann et al., 2010).

The pharmaceutical business must be updated to know customers' needs and interests. These changes in the pharmaceutical business apply to all other healthcare businesses. Becoming more patient-centric is important for the future, success of companies and the well-being of patients and should be established in 3 steps, customer segmentation and segment strategies, redesign of customer contacts and marketing logic, and adjustment of control mechanisms and cultural changes.

The successful implementation of patient-centric initiatives has several difficulties, and determining their effects is challenging for various reasons. It will take time and patience to be patient-centric. (Kenneth Getz, 2015).

Challenges like clinical research professionals gradually incorporate new techniques and approach into their already taxing and difficult operational and scientific processes. Some experts hesitate to include another viewpoint because they think that patients, healthcare payers, and providers will be difficult to work with. Many clinical research experts worry that patient-centricity forces them to abandon conventional methods, such as blinded, randomized, controlled clinical trials. And according to some stakeholders, involved and interested patients may desire to see their clinical trials successful, which could lead to bias in the study results (Kenneth Getz, 2015). These are some challenges to patient-centricity implementation.

The number of companies that successfully implement patient-centricity in the future will increase? The business advantages and disadvantageous will be the ones expected? The global healthcare system will improve? The pharmaceuticals will be wealthy? The patient's needs and values are being more followed and respected?

The answer to these questions is somewhere in the following years. Meanwhile, the healthcare supply chain will be updated, it is a matter of survival.

CHAPTER 5

Conclusions

Patient-centricity can have different definitions depending on the branch to which applies and can be divided into different categories, macro or meso level. Patient-centricity has several benefits for doctors, psychotherapists, employees, teams, and patients. In the healthcare sector, the paradigm focus is shifting to the patient, creating a higher-quality healthcare system. Several pharmaceutical and biotech companies are starting to adopt patient-centricity in research and design. However, transforming patient-centricity is not an easy task and requires patience.

Regarding the bulk of this dissertation, the VosViewer analysis. From 2021 onward, an explosion occurred in the number of published articles, reaching the mark of hundreds of articles published. 574 documents were considered for this dissertation. From this data set, the authors most vibrant are Breitkreutz, Frijlink, Visser, and Woerdenbag. The most cited document is "Oromucosal film preparations: points to consider for patient-centricity and manufacturing processes," with the four co-authors mentioned above and Raphael Krampe. Eli Lilly and Company, Indianápolis; Capsugel, bornem, Belgium and Graz university of technology, Austria, are the ones with the most citations between the different organizations. The 5 countries with the highest rate of citations are the UK, USA, Belgium, Netherlands, and Austria. Relative to the co-occurrence of all keywords, the keyword human is the more occurred with 112 occurrences, followed by article with 63. The keyword patient-centricity is in third with 60 occurrences, in fourth the keyword humans with 55, and fifth with 42 occurrences, the keyword patient care. From a total of 1576 keywords obtained from 574 documents, these five are the most occurred. And finally, relative to sources, the source with more published documents is “Therapeutic innovation and regulatory science”, in second “Studies in health technology and informatics”, and in third “Clinical Therapeutics.”

Becoming patient-centric is a long way goal, but the benefits exist and are clear, such as the obstacles. Is in the hands of the top management companies and the entire healthcare supply chain to work genuinely on this path to achieve patient-centricity for the patients and firms.

References

Barei, F. (2018). Value-added medicines: Is there any room between market access challenges and “patient centricity”? *International Journal of Pharmaceutical and Healthcare Marketing*, *12*(1), 71–76. https://doi.org/10.1108/IJPHM-11-2016-0058

Burmann, C., Meurer, J., & Kanitz, C. (2010). Customer centricity as a key to success for pharma. *Journal of Medical Marketing*. https://doi.org/10.1057/jmm.2010.30

Buske & Medizinio (2022, August). Quality Management and Patient Centricity in the Doctor´s Practice. https://climedo.de/en/blog/quality-management-and-patient-centricity-in-the-doctors-practice/

Carli Lorenzini, G., & Olsson, A. (2022). Exploring how and why to develop patient-centered packaging: A multiple-case study with pharmaceutical companies. *Therapeutic Innovation & Regulatory Science*, *56*(1), 117–129. https://doi.org/10.1007/s43441-021-00338-0

Clarityes1. (2020, november 6). Helping commercial organizations rise to new levels of customer engagement effectiveness. https://clarityes1.com/blog/patient-centricity-a-strategy-for-success/

Du Plessis, D., Sake, J.-K., Halling, K., Morgan, J., Georgieva, A., & Bertelsen, N. (2017). Patient centricity and pharmaceutical companies: Is it feasible? *Therapeutic Innovation & Regulatory Science*, *51*(4), 460–467. https://doi.org/10.1177/2168479017696268

Getz, K. A. (2015). Establishing return-on-investment expectations for patient-centric initiatives. *Therapeutic Innovation & Regulatory Science*, *49*(5), 745–749. https://doi.org/10.1177/2168479015579521

Gyftopoulos, S., Lin, D., Knoll, F., Doshi, A. M., Rodrigues, T. C., & Recht, M. P. (2019). Artificial intelligence in musculoskeletal imaging: Current status and future

directions. *American Journal of Roentgenology*, *213*(3), 506–513. https://doi.org/10.2214/AJR.19.21117

Krampe, R., Visser, J. C., Frijlink, H. W., Breitkreutz, J., Woerdenbag, H. J., & Preis, M. (2016). Oromucosal film preparations: Points to consider for patient centricity and manufacturing processes. *Expert Opinion on Drug Delivery*, *13*(4), 493–506. https://doi.org/10.1517/17425247.2016.1118048

Marques, C. M., Moniz, S., De Sousa, J. P., Barbosa-Povoa, A. P., & Reklaitis, G. (2020). Decision-support challenges in the chemical-pharmaceutical industry: Findings and future research directions. *Computers & Chemical Engineering*, *134*, 106672. https://doi.org/10.1016/j.compchemeng.2019.106672

Mashima, D., & Ahamad, M. (2012). Enhancing accountability of electronic health record usage via patient-centric monitoring. *Proceedings of the 2nd ACM SIGHIT International Health Informatics Symposium*, 409–418. https://doi.org/10.1145/2110363.2110410

Morel, T., & Cano, S. J. (2017). Measuring what matters to rare disease patients—Reflections on the work by the IRDiRC taskforce on patient-centered outcome measures. *Orphanet Journal of Rare Diseases*, *12*(1), 171. https://doi.org/10.1186/s13023-017-0718-x

Perfetto, E. M., & Pomerantz, P. (2021). Listening to the patient voice and learning from the patient experience. *ASA Monitor*, *85*(S10), 27–29. https://doi.org/10.1097/01.ASM.0000795168.75245.f6

Robbins, D. A., Curro, F. A., & Fox, C. H. (2013). Defining patient-centricity: Opportunities, challenges, and implications for clinical care and research. *Therapeutic Innovation & Regulatory Science*, *47*(3), 349–355. https://doi.org/10.1177/2168479013484159

Smith, L. L., Lake, N. H., Simmons, L. A., Perlman, A., Wroth, S., & Wolever, R. Q. (2013). Integrative health coach training: A model for shifting the paradigm toward

patient-centricity and meeting new national prevention goals. *Global Advances in Health and Medicine*, *2*(3), 66–74. https://doi.org/10.7453/gahmj.2013.034

Stegemann, S., Ternik, R. L., Onder, G., Khan, M. A., & van Riet-Nales, D. A. (2016). Defining patient centric pharmaceutical drug product design. *The AAPS Journal*, *18*(5), 1047–1055. https://doi.org/10.1208/s12248-016-9938-6

Szolovits, P. (2011). Possibilities for healthcare computing. *Journal of Computer Science and Technology*, *26*(4), 625–631. https://doi.org/10.1007/s11390-011-1162-3

Team, C. I. (2020, november 6). *Patient centricity—A strategy for success*. ClarityES1. https://clarityes1.com/blog/patient-centricity-a-strategy-for-success/

Tian, Y., Orlu, M., Woerdenbag, H. J., Scarpa, M., Kiefer, O., Kottke, D., Sjöholm, E., Öblom, H., Sandler, N., Hinrichs, W. L. J., Frijlink, H. W., Breitkreutz, J., & Visser, J. C. (2019). Oromucosal films: From patient centricity to production by printing techniques. *Expert Opinion on Drug Delivery*, *16*(9), 981–993. https://doi.org/10.1080/17425247.2019.1652595

Timpe, C., Stegemann, S., Barrett, A., & Mujumdar, S. (2020). Challenges and opportunities to include patient-centric product design in industrial medicines development to improve therapeutic goals. *British Journal of Clinical Pharmacology*, *86*(10), 2020–2027. https://doi.org/10.1111/bcp.14388

Van Eck, N. J., & Waltman, L. (2010). Software survey: VOSviewer, a computer program for bibliometric mapping. *Scientometrics*, *84*(2), 523–538. https://doi.org/10.1007/s11192-009-0146-3

Van Eck, N. J., & Waltman, L. (2017). Citation-based clustering of publications using CitNetExplorer and VOSviewer. *Scientometrics*, *111*(2), 1053–1070. https://doi.org/10.1007/s11192-017-2300-7

Yeoman, G., Furlong, P., Seres, M., Binder, H., Chung, H., Garzya, V., & Jones, R. R. (2017). Defining patient centricity with patients for patients and caregivers: A

collaborative endeavour. *BMJ Innovations*, *3*(2), 76–83. https://doi.org/10.1136/bmjinnov-2016-000157