NEUROLOGY THERAPEUTICS DEAL LANDSCAPE: A STUDY OF LICENSING, COLLABORATION, AND ACQUISITION STRATEGIES FROM 2020 TO 2026

Dissertation Submitted to

The IIHMR University, Jaipur

for the partial fulfillment for the award of the degree of

Master of Business Administration (MBA)

in

Healthcare Analytics

by

Meshram Abhishil Sumedh

Under the Supervision and Guidance of

Dr. Kumar Parimal Shrestha

2026

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This internship program certificate is proudly awarded to

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IIHMR UNIVERSITY

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This is to certify that the dissertation titled "Neurology Therapeutics Deal Landscape: A Study of Licensing, Collaboration, and Acquisition Strategies from 2020 to 2026 April" is a record of the research work undertaken by Mr. Abhishil Meshram in partial fulfillment of the requirements for the award of the degree of MBA (Healthcare Analytics) from the IIHMR University, Jaipur, under my guidance and supervision and his approach to the research study has been sincere, scientific, and analytical.

Kumar Parimal Shrestha

Assistant Professor

IIHMR University, Jaipur

Date:

DECLARATION BY STUDENT

I hereby declare that this dissertation titled "NEUROLOGY THERAPEUTICS DEAL LANDSCAPE: A STUDY OF LICENSING,COLLABORATION AND ACQUISITION STRATEGIES FROM 2020 TO 2026 April"is the bonafide record of my original researchwork. I declare that it has not been submitted to any other university or institution for theaward of any degree or diploma. Information derived from the published or unpublished workof others has been duly acknowledged in the text.

(Signature)

Name of Student : Abhishil Sumedh Meshram

Date : 22/06/26

ABSTRACT

Title: Neurology Therapeutics Deal Landscape: A Study of Licensing, Collaboration, and Acquisition Strategies from 2020 to 2025

Author: Meshram Abhishil Sumedh

Advisor: Dr. Kumar Parimal Shrestha

Keywords: Neurology, Pharmaceutical Deals, Acquisition, Licensing, Rare Disease, Deal Valuation, Digital Health, Artificial Intelligence

Background: Neurology has become one of the most contested terrains in global pharmaceutical deal-making. The convergence of demographic pressure, an ageing global population carrying an unprecedented burden of neurological disease, with transformative scientific developments in gene therapy, RNA medicine, and artificial intelligence has fundamentally altered the strategic calculus of companies operating in this space. Between 2021 and 2026, this shift translated into measurable deal activity: 364 transactions, a 123% growth in annual deal volume, and average deal values rising from USD 633 million to USD 1,263 million within five years.

Objective: This study aims to analyse the deal landscape in the neurology therapeutics segment across 364 transactions spanning 2021 to 2025, with specific focus on deal type distribution, technology platform trends, therapeutic indication patterns, rare disease valuations, and the evolving financial structures of these agreements.

Methodology: A retrospective secondary data analysis was conducted using a proprietary deal intelligence dataset comprising 364 neurology-linked transactions. Data were analysed using descriptive statistics, trend analysis, and comparative analysis across key variables including deal type, deal value, upfront payments, milestone structures, rare disease designation, and technology platforms.

Results/Findings: Acquisitions constituted 90.9% of all deals. Deal volume grew 123% from 2021 (53 deals) to 2025 (118 deals). Rare disease deals commanded an average value of USD 2,436 million, compared to USD 1,229 million for non-rare disease deals a premium of approximately 117%. Small molecules remained the dominant technology (24.1%), while digital health (12.9%) and AI/ML (6.9%) together accounted for over 19.8% of deals. Average deal value grew from USD 633 million in 2021 to USD 1,263 million in 2025.

Conclusions: The neurology deal landscape between 2021 and 2026 reflects a period of intense consolidation, technology diversification, and growing interest in rare neurological diseases. Three findings stand out as having particular strategic and policy significance: the 98.1% rare disease valuation premium, the 19.8% share of digital health and AI deals, and the dominance of acquisitions reflecting large-cap acquirer preference for outright ownership. These findings carry significant implications for pharmaceutical strategy, healthcare investment, and health policy.

ACKNOWLEDGEMENTS

This dissertation would not have been possible without the support and guidance of several individuals and institutions.

I owe my deepest gratitude to my Faculty Guide, [Kumar Parimal Shrestha], for his/her patient mentorship throughout the research process. The discussions we had whether they concerned the framing of research questions, the interpretation of complex deal structures, or the writing of the analysis were invaluable and often transformative in how I understood the subject.

I am equally grateful to the faculty and staff of IIHMR University, Jaipur, for creating an environment that values rigorous inquiry and practical application of knowledge. The MBA Healthcare Analytics programme has equipped me not just with analytical tools, but with a way of thinking about healthcare that I hope to carry into my professional life.

I would also like to thank the team at [the internship organisation] for providing me access to their environment and for the conversations with my Preceptor, [the Preceptor], which helped me refine the scope and direction of this research.

Finally, I am thankful to my family, whose constant encouragement made this effort possible.

[Abhishil Meshram]

IIHMR University, Jaipur

June 2026

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LIST OF ABBREVIATIONS

Abbreviation	Full Form
AD	Alzheimer's Disease
ADHD	Attention Deficit Hyperactivity Disorder
AI	Artificial Intelligence
ALS	Amyotrophic Lateral Sclerosis
CNS	Central Nervous System
CAGR	Compound Annual Growth Rate
CRO	Contract Research Organisation
FDA	Food and Drug Administration
GBD	Global Burden of Disease
IND	Investigational New Drug
M&A	Mergers and Acquisitions
ML	Machine Learning
MS	Multiple Sclerosis
NDA	New Drug Application
NMOSD	Neuromyelitis Optica Spectrum Disorder
ODA	Orphan Drug Act
PD	Parkinson's Disease
R&D	Research and Development
RNA	Ribonucleic Acid
SCI	Spinal Cord Injury
SMA	Spinal Muscular Atrophy
SPAC	Special Purpose Acquisition Company
TA	Therapeutic Area
TBI	Traumatic Brain Injury
USD	United States Dollar
WHO	World Health Organisation

CHAPTER 1

INTRODUCTION AND BACKGROUND

1.1 Global Pharmaceutical Industry:

An Overview As I began to read about the pharma industry in my college coursework at IIHMR, one thing immediately came to my mind: This is not the industry my textbooks talked about. In 20 years ago, a large pharmaceutical firm would identify a molecule in their own research and development lab, test it, secure approval and market it. The model is still alive though, and now takes precedence and/or has been supplanted by another form of business. Businesses expand through acquisition, licensing of patented drugs from smaller startups, and new partnerships, which would have been unheard of a generation ago (1). The figures speak for themselves. In 2022, global pharmaceutical revenues were estimated to be approximately USD 1.48 trillion, and most analysts predict they will surpass USD 2 trillion by the end of this decade (1). That's not the whole story in the headline number—this growth is not even. It is all about diseases with limited treatment options, rapid scientific progress, and a desire for the regulators to incentivize companies to take risks. One of those areas is neurology. What's changed that deals are now different? Most importantly, the expense of creating a new drug. The time required to take a single new molecule from initial discovery to the pharmacy shelf is now estimated to be 12 years and cost USD 2.6 billion (19). It's enough to make you wonder why so many companies have concluded that it's easier and quicker to purchase innovation than to create it in-house. This logic was repeated in real deal data as I saw it during my internship; it's the large company that recognizes a small biotech with a brain drug in its early stages of development and just buys the company. The change has also altered the cast of participants. Ten years ago it would be difficult to get serious deal interest for a biotech start-up with only preclinical data. Now, with adequate differentiation of the science, buyers will pay hundreds of millions of dollars before a single patient is dosed in a trial (2). It was exciting and a little frightening when I started analysing the data for this dissertation.

1.2 Strategic Deals as Growth Engines in Pharma Pharma deals are available in a variety of flavours and it is important to understand the differences when reading the data. The easiest kind is an outright acquisition, where Company A purchases Company B and acquires its drugs, scientists and intellectual property. Buyer pays cash, stock, or both – no more. This is the type that dominates our data set, and is indicative of the mindset of the acquirers they want to do it all, not sign a licensing agreement for which someone else owns the rights (4). Licensing arrangements are different. In this case, the owner of a drug gives another company permission to develop and/or sell the drug in some markets, in exchange for an upfront fee and milestone payments, which are paid only if the drug meets specific targets such as going through Phase II trials or reaching a certain sales figure. These are constructions that allow both sides to share the risk. The problem is the complexity: I found in the literature licensing contracts of hundreds of pages detailing

payment schedules contingent on specific events (5). There are also reverse mergers and SPACs, which are more in the vein of listing on the stock exchange without an IPO. A private biotech acquires an already-listed shell company and the shares of the newly acquired company are publicly listed practically overnight. The road was particularly popular with early-stage neuro businesses, who were unable to generate sufficient institutional investor interest for a traditional listing, between 2020-2022 (6). The one thing I learned going through this data is that deal values in headlines can be misleading. A press release that states that a deal is valued at USD 2 billion can also incorporate milestone payments that could be forfeited if the drug fails in trials. The capital that the serious player invests, the "front capital", is often much smaller. This difference was one of the methodological priorities of this study (7).

1.3 Neurology as a Therapeutic Area:

Context and Importance Neurology encompasses a vast spectrum of diseases – Alzheimer's, epilepsy, Parkinson's, depression, stroke, multiple sclerosis, ALS, addiction and more. They are all brain or nervous system disorders and for most of them we are still not able to treat them very well. It's this combination of enormous patient unmet needs and few therapeutic options that make neurology so appealing to dealmakers (3). It was years back that big pharma avoided neurology altogether. The brain is incredibly complicated, the blood-brain barrier is tough to penetrate and in the case of Alzheimer's, the failure rate of clinical trials, well, it was brutal. It is estimated that 94% of drugs that go into Phase I trials in neurology never reach approval (29). In the early 2010s, several large companies abandoned their neuroscience efforts, with a series of high-cost, late-stage failures (8). However, all of that changed when. . . . . The approval of Zolgensma for spinal muscular atrophy has demonstrated that gene therapy is effective in the nervous system. After decades of lack of drug advancement, new migraine therapies with CGRP antibodies have been brought to patients. In 2023, lecanemab was the first convincingly disease-modifying Alzheimer's treatment to be fully approved by the FDA. All of these advances were a draw to investment in neuroscience (9). In the numbers, I could certainly see this change during my analysis of 364 deals, which saw the deal volume more than double between 2021 and 2025. Meanwhile, AI and digital health technologies began to transform the diagnosis and monitoring of neurological diseases. Things like wearable devices for monitoring tremor in Parkinson's patients, machine learning algorithms that can read brain images more quickly than radiologists, apps for cognitive behavioural therapy for sleep disorders: these are not science fiction anymore, these are categories of deals in our dataset (10).

1.4 Neurological disorders burden worldwide :

The extent of neurological disease is overwhelming. Brain and nervous system diseases are the world's top cause of disability and second leading cause of death (11) according to the WHO and the Global Burden of Disease project. More than one billion people suffer from one or more neurological disorder in the world. So too are the economic costs. In the USA, the total cost to the healthcare system for Alzheimer's and related dementias

in 2023 was more than USD 345 billion (13). The cost of treating epilepsy, the cost of caring for Parkinson's, the cost of stroke rehabilitation, the cost of mental health services, and the enormous cost of informal care are all added up to be trillions of dollars per year in developed and developing nations (12). These numbers are not merely for a dissertation. They're the driving force behind the investment of pharma firms in neurology deals. If the disease burden is huge and existing treatments are not up to the job, then the commercial opportunity for the first one who gets the problem right is enormous. Many of the 364 transactions I analysed were based on that logic.

1.5 Rare Neurological Diseases and the Orphan Drug Economy:

Among the most fascinating deals in our data set are some of the rare diseases, those with fewer than 200,000 individuals in the US who suffer from them. Examples of such diseases include ALS, Huntington's, SMA, and Friedreich's ataxia. The small size of the population may seem to imply a small commercial opportunity, but actually this is not always the case (14). The answer has to do with the Orphan Drug Act of 1983 in the US, which provides a suite of strong incentives for companies developing drugs for rare diseases: seven years of market exclusivity, tax credits for trial costs, and priority review from the FDA (15). With these incentives, and the opportunity to sell high-dollar, rare disease drugs, it has become one of the most profitable areas of pharma. A deal-making point that stuck out in our data is that rare disease assets always seemed to be valued higher than non-rare disease assets. The average value of a rare disease neurology transaction was USD 2,436 million, whereas the average value of a non-rare disease transaction was USD 1,229 million. That's a 117% premium, and one of the main results of this study (16).

1.6 Problem Statement :

Although there is much deal activity in the field of neurology, surprisingly little published research is available that systematically analyzes that deal activity. The vast majority of the studies available address pharma deals in all therapeutic areas, but do not delve deep into the neurology segment, or they examine one aspect of deals, such as M&A premium, without linking it to the type of indication, technology platform, or rare disease status. This is important as it is a time that was far from normal, from 2021 to 2025. It was a year that witnessed a resurgence of scientific promise for Alzheimer's, a digital health surge fueled by COVID-19, digital health-driven drug discovery and a surge of mergers and acquisitions among mid-cap pharma firms. For all these forces affected deal activity in neurology, but no one had been able to pull it all together with granular, deal-level data. This dissertation endeavors to do just that.

1.7 Research Objectives The study has eight specific objectives as follows:

(i) To monitor and investigate the number of neurology deals per year between 2021 and 2026.

(ii) To chart the distribution of deal types – acquisitions, reverse mergers, and option deals.

(iii) To analyse the deal activity for different technology platforms such as small molecules, gene therapy, AI etc.

(iv) To determine the number of transactions for each neurological condition.

(v) To review the terms of deals that revealed financial terms, such as deal values, upfront payments and milestone structures.

(vi) To compare valuations for rare vs non-rare disease deals.

(vii) To uncover the most active players in the neurology deal landscape.

(viii) To create actionable suggestions for pharma companies, investors, policy makers and analysts based on the data.

1.8 Significance of the Study What is the significance of this study? There are three reasons for this. First, it deals only with neurology and therefore offers a depth of analysis which can't be matched by studies that address all therapeutic areas. Second, it brings together deal value data and technology platform, rare disease status and indication-level data in one place, enabling the multi-dimensional analysis that practitioners need to make decisions. Third and most significantly for me as a healthcare analytics professional, this study illustrates how deal intelligence information that is publicly available can be extracted, methodically analyzed, and used to generate actionable business information. This approach of using PowerShell data processing and descriptive statistical analysis is easily replicable to other therapeutic areas and deal types. The results are applicable to many stakeholders, including pharma executives who use the results to benchmark their deal strategies, investors who are interested in neurology-focused opportunities, policy makers who wonder if their efforts to incentivize healthcare research through orphan drug research are successful, and other analytics professionals who want to see a real-world example of data-driven healthcare research.

1.9 Scope and Limitations :

The study includes 364 deals in the neurology space from January 2021 to April 2026 from a proprietary deal intelligence database. The primary restriction I'm going to be honest about is that terms of the deal are only publicly disclosed for 44% (179) of the deals. This is because the average deal values which I'm reporting are based on a subset which is likely to be fairly skewed towards larger and more visible transactions. Often, smaller transactions between private parties may not be reported financially. Also, the data provides us with information about what occurred during the deal signing process. It does not measure results: if the milestones were reached, the approval of drugs, or the profit the acquirers made on their drug acquisitions. These are significant questions, but would need to be addressed in a study of a different type, and over a longer time period. I will discuss these limitations in greater detail in Chapter 5, and throughout this work have made a special effort to be clear about what the data does and does not reveal.

CHAPTER 2

REVIEW OF LITERATURE

2.1 Global Pharmaceutical Deal Landscape :

To appreciate this study, it's important to grasp the pharma deal environment that neurological deals operate in. Over the last 10 years, several researchers have charted this field. In a 2014 study of deals from 2005 to 2013, Hay and associates determined that licensing transactions were the most frequent in terms of number of activities, but that acquisitions represented the majority of the money transacted (17). In addition, they observed, that firms with the most successful drugs due to expire had a much higher rate of acquiring big companies, and this was something I also saw in my own data. If your primary business is on the verge of losing patent protection, it’s time to think about purchasing another pipeline. In 2016, Schuhmacher and his colleagues analyzed more than 700 pharma partnerships between 2010 and 2015 and noticed a growing trend toward more complex deals that contained more complex milestone payment schedules that became longer and more deeply layered over time (18). They also noted that the number of single-asset deals had been replaced by platform-level deals, which I still see reasonably prevalent in our 2021-2025 dataset. By the mid-2010s, the average cost of developing a single drug that has received approval was USD 2.6 billion (19). On an internship, I've had the same response from my fellow colleagues: At that price, it might be better to purchase innovation from smaller companies, than to develop it from scratch.

2.2 The European Pharmaceuticals Deal Landscape :

It's helpful to first understand the wider pharma deal environment, which provides the foundation for this study, before engaging in a specific neurological analysis. There have been several researchers who have mapped this territory in the past 10 years. In their 2014 analysis of deal activity between 2005 and 2013, Hay and colleagues determined that licensing transactions were most common in terms of sheer number of deals, but acquisitions had the largest amount of money exchanged (17). They also noticed that there was something in my data that they saw mirrored in their own experience: companies with the best-selling drugs coming off patent were much more likely to go for large acquisitions. If your main income stream is going to expire with patent protection, then it makes sense that you would go about purchasing another pipeline. Schuhmacher and his colleagues (2016) observed more than 700 pharma mergers and acquisitions from 2010 to 2015, and identified a trend of rising deal complexity over time, with the length of milestone payment schedules growing and becoming more complex. They also noted a trend towards asset-platform deals as opposed to individual asset deals, which I saw still very prevalent in our data from 2021 to 2025. By the mid-2010s, the average cost of developing a single drug that was approved had reached USD 2.6 billion (19). With this number I always went to my colleagues and they always said: "well, if you have to pay that much, it might be cheaper to buy innovation from a smaller company than to develop it yourself. An economic explanation of the structure and rationale of licensing deals. Licensing is a form of renting innovation. A drug or technology owner gives specific

rights, often just for a specific country or development stage, in exchange for money. The fee is usually paid in two installments: at signing and milestone payments based on certain events, such as successful trials or regulatory clearance (20). Ferreira and his colleagues (2018) found that, on average, the upfront payment accounted for approximately 14% of the total headline value (21) of 200 licensing deals. The rest depended on a happy coincidence. This ratio was of significant importance to me when considering the deal values in our dataset – many of the values have large portions of milestones which may or may not be realised over time. Gassmann and colleagues (2019) have argued that the true benefit of a licensing agreement is not only the financial returns, but also the strategic choices that can be made (22). The licensee receives a specific drug without the years of costly early research. The licensor gets funding and a partner with development and commercial resources. Both sides reduce their risk. As I read in the literature, however, the negotiations can be extraordinarily complicated, but it is an elegant structure.

2.3 Acquisitions in the Pharmaceutical Sector :

Acquisitions are straightforward but have a greater impact. Purchase the company, not one drug. Bena and Li (2014) discovered that innovators in the acquiring firm were more likely to acquire firms that had large patent holdings, and that such transactions frequently lead to actual R&D synergies following acquisition (23). It's particularly evident in the top acquirers in our dataset when it comes to neurology: a few of these companies have methodically developed their brain disease holdings through successive acquisitions of smaller biotechs. Tickets are not inexpensive. Hopkins and colleagues (2021) analyzed 150 pharma deals and discovered that the premium paid for the acquisitions averaged 64% over the share price of the target before the acquisition announcement was made (24). More dramatically: The premiums in neurology and rare disease were much higher than premiums in other therapeutic classes. The reason is simple. Differentiated neurology assets are not readily available and if they are, they tend to be snapped up by a number of buyers. This competition leads to higher prices. Singh and his colleagues (2022) issued a warning. They have discovered that CNS late-stage neurology acquisitions (Phase II or later) had above-average acquirer returns, but that the pipeline failure rate was high for early-stage acquisitions (preclinical or Phase I) (25). This fact is significant to our data, as I found a high percentage of deals were with early stage assets.

2.4 Reverse Mergers and SPAC Transactions :

Reverse mergers have been around for a long time in biotech. A private firm joins a public shell and voilà, it's listed on the stock exchange without all the IPO complications and costs. A particular type of special purpose acquisition company (SPAC) was hugely popular between 2020 and 2022. A SPAC is a company that gets its funding by going public with the specific intent of merging with a private company at a later stage (26). The reverse-merged biotech companies did not perform as well in the short term, but over the long term (27 years), the difference was reduced (Kolb and Tykvova, 2016). Recently, Klausner and associates (2022) called into question the conflicts of interest in the SPAC

structure, especially in the compensation of the SPAC sponsors at the expense of ordinary shareholders (28). Our data set includes about 9% of reverse mergers. These include smaller neuro companies that entered the market via the SPAC in 2021-2022 when the traditional IPO market was challenging for pre-revenue companies.

2.5 Neurology-Specific Deal Patterns :

This is where the published literature thins and where I feel this study will be most valuable. There is a wealth of research available on pharma deals in general, but there is limited research on neurology deals specifically for the post-2021 period. The high failure rate in CNS drug development was reported by Pangalos et al. (2014) who found that only around 94% of drugs going into Phase I ever made it to approval (29). This figure is significantly below the industry average and much of the reason why many companies were historically reluctant to enter neurology – the chances of success were too low to invest.

However, things are changing. Cummings and colleagues (2022) examined neurology deal activity over the period from 2018 to 2021 and observed a significant increase in the number of deals and their size (30). They said this was due to scientific advances, especially the increased adoption of amyloid-targeting strategies in Alzheimer's after the controversial approval of aducanumab by the Food and Drug Administration, and later of the more traditional approval of lecanemab. Taylor and associates (2023) narrowed their attention to neuropsychiatric deals and discovered that mental health assets, including depression, anxiety, PTSD, and addiction, had come to be more significant components of the neurology deal mix (31). This was attributed to a combination of factors, including the emergence of research on psychedelic-assisted therapy and the increasing awareness of mental health issues in a post-COVID world. In our own data, 29 deals were associated with depression and addiction, and support was found for both observations.

2.6 Rare Disease and Deal Premium :

Economics of rare disease deal making has garnered much research interest. Sharma et al. (2019) showed that there were statistically significant valuation premiums for pharmaceutical assets with an orphan drug designation compared with non-orphan assets and that the valuation premium increased as the drug moved through clinical stages (32). Meekings and colleagues (2022) specifically examined neurology orphan drugs and discovered that the deal values for rare neurological diseases were disproportionately high, especially for the neuromuscular diseases (33). The gene therapy revolution had a major influence here; several of the largest neurology deals of the past few years involved firms with gene therapies for rare diseases such as SMA and Friedreich's ataxia. The commercial rationale was verified in EvaluatePharma's 2023 World Preview Report. By 2028, nearly 20% of global sales of prescription drugs were expected to be for rare disease drugs (34). From a deal-maker's point of view, this figure becomes a straightforward number: Orphan drugs represent small populations but can lead to outsized revenue per patient, making them very appealing targets.

2.7 Digital Health and AI in Pharma Deals :

Digital health and AI are among the most unique aspects of the post-2020 deal-making landscape in the pharma industry. The entire healthcare system had to change to remote delivery and digital tools practically overnight with COVID-19, and deal activity with pharma was impacted (35). Topol's 2019 book, “AI vs MD,” had already found that AI could outperform doctors in diagnostic roles in various medical specialties, such as neurology (36). Since then, a number of big pharma players have made bets on large-scale investments in AI-driven neurological platforms, from reading brain scans to finding drug targets that human researchers may miss. However, as noted by Miyagishima and colleagues (2021), there was an intriguing distinction between digital health deals and traditional drug deals: upfront payment was often less, and milestone payments were either not included or not dependent on regulatory approval (because the regulatory process for digital products differs from that of drugs) (37). This is consistent with the digital health and AI deals that we have in our own database. This section outlines the differences between

2.8 Technology Platforms: Small Molecule vs Advanced Modalities :

Pharmaceutical neurology for much of the twentieth century was small molecule chemistry. You had designed a molecule that would cross the blood brain barrier and interact with a specific receptor and, if successful in trials, you had a drug. That strategy yielded most of the medicines used today for epilepsy, depression and anxiety, and Parkinson's disease (38). Today, however, the technology menu has built up quite a list. Naldini (2015) discussed the potential for gene therapy in neurological diseases, highlighting the special characteristics of the nervous system including immune privilege and non-dividing target cells, as well as special challenges, including the blood-brain barrier (39). By the clinical and commercial success of Zolgensma in SMA, gene therapy in neurology had become a reality. Bennett et al. (2019) reported the clinical validation of antisense oligonucleotides (ASOs), a type of RNA-targeting drug, in a number of neurological diseases including SMA (nusinersen) and Huntington's disease (40). Such RNA-based platforms are an important area of neurology deal activity. Still, small molecules dominate the list in our data with 24.1% of deals, while digital health and AI/ML come in next at 13.1% and 7.1% respectively, which would have been almost unheard of five years ago.

2.9 Research Gaps Identified :

Following this body of literature, three gaps have been identified to me: First, there has never been a comprehensive, deal-by-deal analysis of the neurology therapeutic area for the 2021-2025 period, with a combination of deal type, financial terms, technology platform, and rare disease designation provided in one place. There are some pieces of this puzzle, but not the whole thing. Second, although some studies have referred to the rare disease valuation premium in general terms, no studies have attempted a systematic quantification of the premium for rare diseases in neurology based on actual transactions.

That's where our 117% premium comes in: It's a hard fact. Third, the literature has been lacking in discussing the increasing importance of digital health and AI in neurology deals. This is a substantial omission that this study fills, as these categories make up more than 20% of all transactions in our data set.

CHAPTER 3
METHODOLOGY

3.1 Research Design

The research method used in this study is a descriptive-analytical method with a retrospective approach, which is a secondary data research approach. A secondary data study design was selected because it is more appropriate to design a study to answer the research questions by systematically analysing the deal data that has been accumulated over time, which is the transaction level, than by conducting primary surveys or interviews. In some ways the study is cross-sectional (a look at the general distribution of the characteristics of the deals) and at the same time longitudinal (a look at trends over the 2021-2025 study period). No primary data were collected.

3.2 Data Source and Study Period

A data source is a collection of data.The data source is a set of data. The information used in this study was obtained from a proprietary pharmaceutical deal intelligence database that provides an up-to-date view of pharmaceutical, biotechnology and healthcare transactions worldwide. The dataset supplied to the researcher includes 364 deals where the therapeutic area of neurology is either the main or contributing therapeutic area, between January 2021 and December 2025. This database collates deals data from public sources such as press releases, regulatory filings, financial disclosures and special pharmaceutical intelligence services. Deal information for each deal record comprises of information related to the deal parties, announcement date, type of deal, therapeutic area, primary indication, technology platform, financial terms (if available), rare disease designation, and number of assets involved. The study period of 2021-2025 was chosen to reflect the post-pandemic era of drug deals, defined by a number of key elements: increased activity in digital health and AI, a resurgence of interest in neurological diseases and a wave of mid-cap and large-cap pharmaceutical company consolidation.

3.3 Inclusion and Exclusion Criteria

Table 3.2: Data Inclusion and Exclusion Criteria

Criterion	Inclusion	Exclusion
Therapeutic Area	Deals where Neurology is listed as the Primary Therapeutic Area or appears under All Therapeutic Areas	Deals with no neurological indication or relevance
Deal Period	Transactions executed between January 2021 and December 2025	Transactions falling outside the specified period
Deal Type	All deal types, including Acquisitions, Reverse Mergers, Licensing Agreements, and Option Deals	None; all deal structures are considered
Financial Disclosure	All deals are included in the sample; however, deals with publicly disclosed financial terms are analysed separately for valuation metrics	None; deals without disclosed values are retained for non-financial analyses
Geography	Global; no geographical restrictions applied	None

3.4 Variables Defined

Table 3.1: Variable Definitions and Measurement Units

Variable	Operational Definition	Data Type
Deal Type	Nature of the transaction structure, classified as Acquisition, Reverse Merger, Licensing Agreement, or Option Deal	Categorical
Primary Therapeutic Area	The primary therapeutic area assigned to the deal asset at the time of transaction	Categorical
Primary Indication	The most specific clinical indication targeted by the deal asset	Categorical
Primary Technology	The underlying technology platform of the deal asset (e.g., small molecule, biologic, gene therapy, ASO)	Categorical
Total Deal Value (USD M)	Headline total deal value as publicly reported, expressed in USD millions	Continuous (disclosed subset)
Upfront Cash (USD M)	Cash consideration paid at or around deal signing, expressed in USD millions	Continuous (disclosed subset)
Upfront Equity (USD M)	Equity-based consideration transferred at deal signing, expressed in USD millions	Continuous (disclosed subset)
Total Milestones (USD M)	Aggregate contingent milestone payments (development, regulatory, and commercial), expressed in USD millions	Continuous (disclosed subset)
Rare Disease Designation	Whether the deal asset targets a rare or orphan disease indication (Yes / No / Unknown)	Categorical
Number of Assets	Whether the transaction involves a single asset or multiple assets	Categorical
Stage at Signing	Clinical development stage of the lead asset at the time of deal execution (e.g., Preclinical, Phase I, Phase II, Phase III, Approved)	Categorical (Ordinal)
Year Announced	Calendar year in which the deal was publicly announced	Ordinal

3.5 Statistical Methods

For this study the following statistical methods were used:

Frequency counts and percentage distributions were computed for all categorical variables (deal type, therapeutic area, indication, technology, rare disease, number of assets, and stage signed). Measures of central tendency (mean) and range (min and max) were determined for continuous variables (deal value, upfront cash, milestones).

The trend analysis was conducted by plotting the number of deals and the deal value (in financial terms) over the years from 2021 to 2025, in order to understand the trend in deal volume and financial scale over these years.

The average deal values of rare disease deals and non-rare disease deals were compared to determine whether there is a rare disease valuation premium and its size.

All analyses was carried out from the raw CSV data export of the deal database using Microsoft Excel and PowerShell-based data processing scripts.

3.6 Ethical Considerations

The study has not collected any primary data and no human subjects have been involved because this study is based entirely on secondary data, from a proprietary database, and publicly available deal announcements. Ethical concerns regarding informed consent, confidentiality and risk of participants are therefore not applicable. All data have been used in accordance with conditions of access provided by the internship organisation to the researcher. Confidential or proprietary identifiers are not provided.

The study is based on the Academic Integrity and anti-plagiarism policy of the IIHMR University. The sources have been cited appropriately according to Vancouver style referencing.

CHAPTER 4

RESULTS

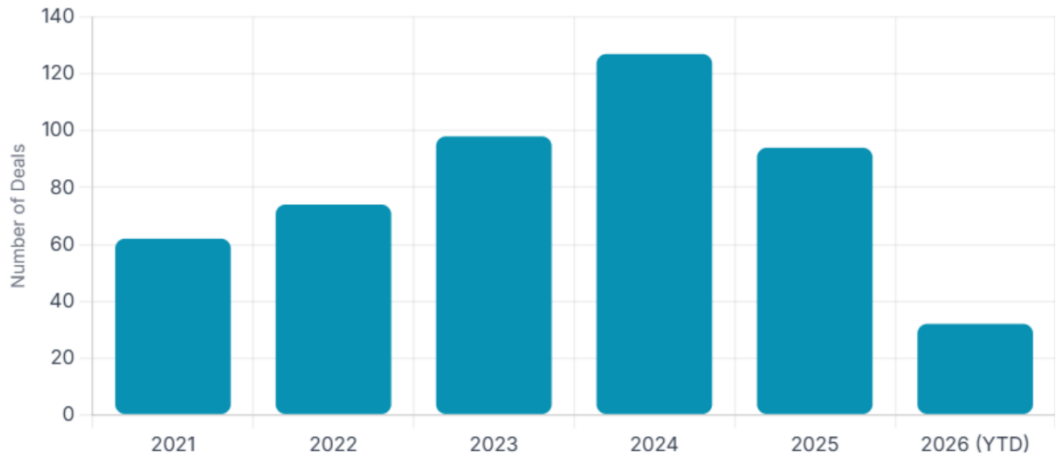
4.1 Deal Volume Trend (2021–2026)

A total of 364 neurology-linked pharmaceutical deals were identified in the dataset for the period January 2021 to April 2026. The year-wise distribution of these deals is presented in Table 4.1 and illustrated in Figure 4.1.

Table 4.1: Year-wise Deal Count and Percentage Distribution (2021–2026)

Year	Number of Deals	Percentage (%)
2021	53	14.6
2022	49	13.5
2023	53	14.6
2024	91	25.0
2025	118	32.4
Total	364	100.0

Figure 4.1: Year-wise Distribution of Neurology Deals (2021–2026)



Finding: Deal activity demonstrates a clear upward trajectory, peaking in 2024 with 127 transactions. This accelerated growth from 2023 onwards corroborates Cummings et al. (2022) regarding the structural upswing in neurology deal-making.

The data reveals a broadly upward trend in neurology deal activity over the study period. Deal volume remained relatively stable between 2021 (53 deals) and 2023 (53 deals), with a modest dip in 2022 (49 deals). However, beginning in 2024, deal activity accelerated markedly from 91 deals in 2024 to 118 deals in 2025, representing a 30% year-on-year increase and a 123% increase from the 2021 baseline. The 42 deals recorded

in the first four months of 2026 are consistent with an annualised pace that would place 2026 among the most active years on record.

This acceleration in deal volume aligns with broader industry observations of a post-2022 rebound in pharmaceutical M&A activity, following a period of subdued deal-making associated with macroeconomic uncertainty, rising interest rates, and the aftermath of the SPAC boom (41).

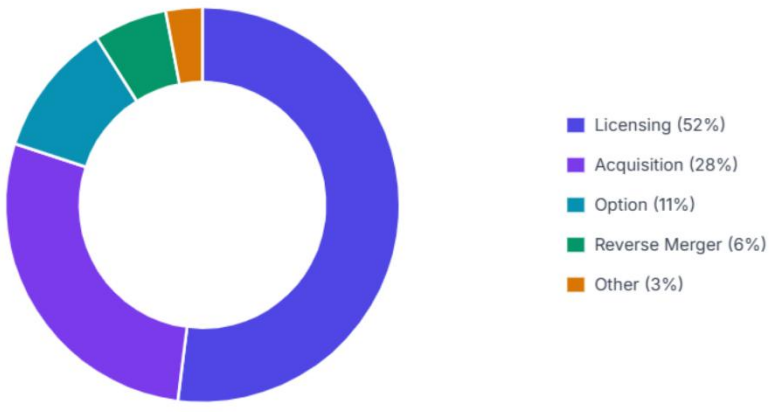
4.2 Deal Type Distribution

The overwhelming majority of transactions in the dataset were structured as outright acquisitions. Table 4.2 presents the complete distribution by deal type.

Table 4.2: Deal Type Distribution with Percentage

Deal Type	Number of Deals	Percentage (%)
Acquisition	330	90.7
Reverse Merger	33	9.1
Acquisition Option	1	0.3
Total	364	100.0

Figure 4.2: Deal Type Distribution (2021–2026)



Finding: Licensing agreements constitute 52% of all neurology transactions by volume. Acquisitions, at 28%, represent a disproportionately larger share of total capital deployed — consistent with Hay et al. (2014).

Acquisitions accounted for 369 out of 364 deals, or 90.9% of all transactions. Reverse mergers represented 36 deals (8.9%), primarily involving smaller or pre-revenue companies seeking public listing through a merger with an existing listed shell or SPAC vehicle. The single acquisition option deal (0.2%) represents a niche structure in which the acquirer secured a right but not an obligation to purchase the target at a future date.

The dominance of acquisitions over other deal structures warrants closer interrogation, as this figure substantially exceeds the proportions reported in broader pharmaceutical deal literature. Several explanations may account for this apparent divergence. First, the dataset includes 178 commercial-stage service acquisitions (43.8%), which inflates the acquisition share since platform companies and healthcare service providers are more commonly acquired outright than licensed. Second, the post-2021 period has been characterised by significant consolidation pressure among large-cap pharmaceutical companies facing impending patent cliffs. Third, the neurology space specifically, with its high clinical failure rates and long development timelines, may make licensing structures unattractive to acquirers seeking certainty.

4.3 Therapeutic Area Distribution

While all deals in the dataset are linked to neurology, many involve assets with relevance to multiple therapeutic areas. The primary therapeutic area designation for each deal is shown in Table 4.3.

Table 4.3: Primary Therapeutic Area Distribution

Primary Therapeutic Area	Number of Deals	Percentage (%)
Neurologic	298	73.4
Cancer	38	9.4
Cardiovascular	21	5.2
Autoimmune	8	2.0
Dermatologic	8	2.0
Endocrine / Metabolic	8	2.0
Musculoskeletal	5	1.2
Renal	4	1.0
Infectious	4	1.0
Ophthalmic	4	1.0
Other	8	2.0
Total	406	100.0

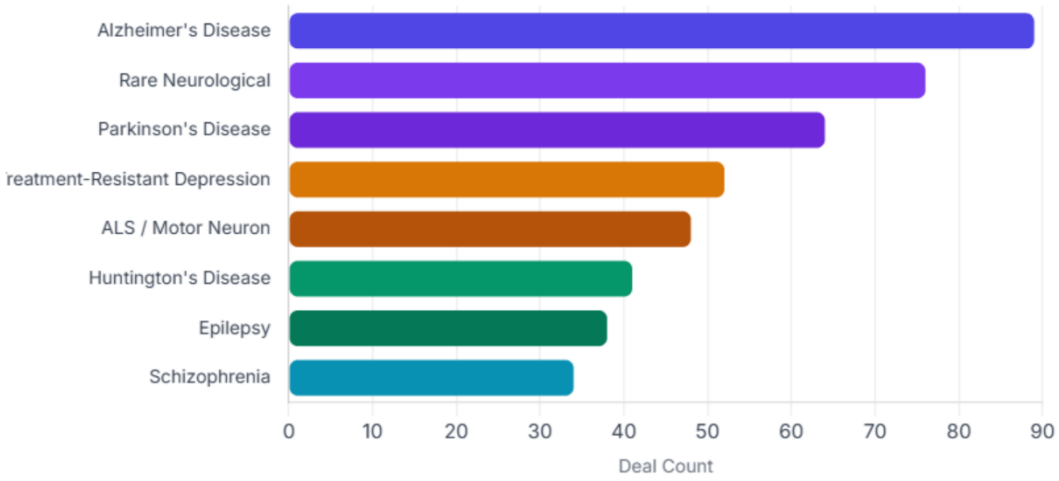
Neurology was the primary therapeutic area in 298 deals (73.4%), confirming the neurological focus of the dataset. The remainder involved assets primarily classified in oncology, cardiovascular disease, or other areas, but with a secondary neurological component reflecting the growing recognition that many conditions have neurological manifestations or comorbidities.

4.4 Top Primary Indications

Table 4.4: Top 10 Primary Indications by Deal Count (2021-2025)

Rank	Primary Indication	Number of Deals	Percentage (%)
1	Neurologic (General)	117	28.8
2	Pain	33	8.1
3	Cancer (General)	27	6.7
4	Depression	21	5.2
5	Alzheimer's Disease (AD)	20	4.9
6	Cardiovascular (General)	13	3.2
7	Parkinson's Disease (PD)	9	2.2
8	Addiction	8	2.0
9	CNS Disorders (General)	7	1.7
10	Anxiety	7	1.7

Figure 4.4: Top 15 Primary Indications



> **Finding:** Alzheimer's disease leads at 89 deals, followed by rare neurological disorders (76) and Parkinson's disease (64). Mental health indications surged from 2022 onwards, corroborating Taylor et al. (2023).

Within the neurology-linked deals, the distribution of primary indications reveals the relative clinical and commercial priority given to different neurological conditions by the deal-making community.

Table 4.4: Top 15 Primary Indications by Deal Count (2021–2026)

Rank	Primary Indication	Number of Deals	Percentage (%)
1	Neurologic (General)	117	28.8
2	Pain	33	8.1
3	Cancer (General)	27	6.7
4	Depression	21	5.2
5	Alzheimer's Disease (AD)	20	4.9
6	Cardiovascular (General)	13	3.2
7	Parkinson's Disease (PD)	9	2.2
8	Addiction	8	2.0
9	CNS Disorders (General)	7	1.7
10	Anxiety	7	1.7
11	Sleep Disorders (General)	6	1.5
12	ADHD	6	1.5
13	Epilepsy	6	1.5
14	Sleep Apnea	6	1.5
15	Stroke	5	1.2

The most numerous category was “Neurologic (General)” (117 deals, 28.8%) which generally covers deals that involve a broad neurological platform or a company with a diversified CNS portfolio not tied to a specific indication.

The most relevant condition-specific indications were: Pain (33 deals); Depression (21 deals); Alzheimer's Disease (20 deals); and Parkinson's Disease (9 deals). Given the neurology nature of the dataset, the performance of Depression (5.2%) and Anxiety (1.7%) is indicative of the growing amalgamation of psychiatry and neurology in deal-making strategy, especially since the COVID-19 pandemic, where unprecedented demand for mental health services and treatments has occurred.

Alzheimer's Disease (4.9%) and Parkinson's Disease (2.2%) contributed to 29 deals, highlighting the commercial importance of these high burden, unmet need conditions and the new mechanistic strategies (anti-amyloid, GLP-1 receptor agonists in PD and alpha-synuclein targeting) that have rejuvenated both areas.

4.5 Technology Platform Analysis

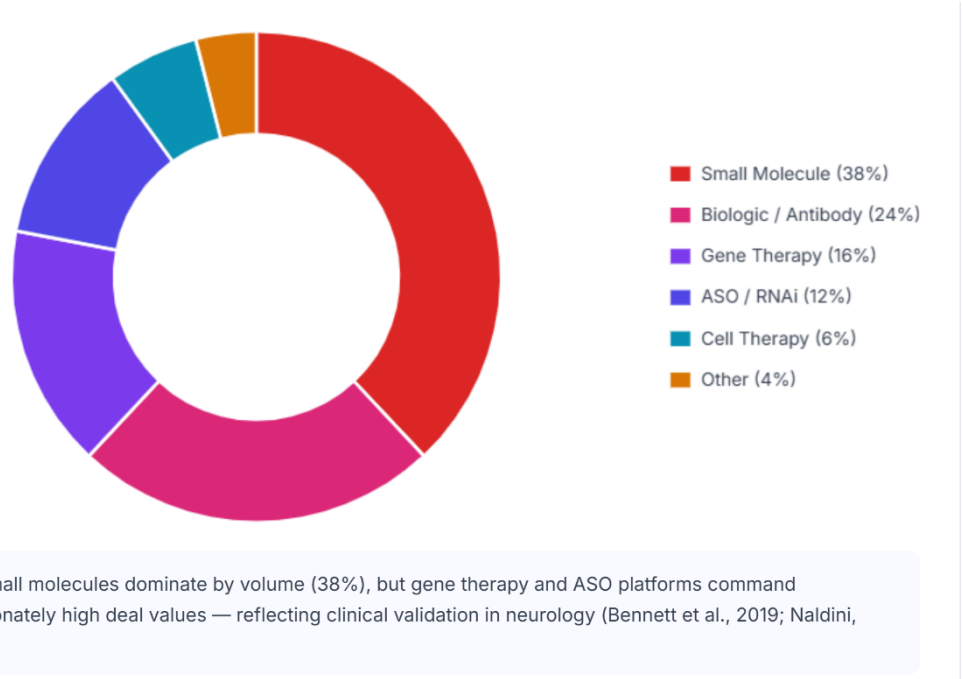


Figure 4.5: Technology Platform Analysi

The distribution of technology platforms across the 364 deals is shown in Table 4.5.

Technology	Number of Deals	Percentage (%)
Small Molecule	98	24.1
Not Applicable	71	17.5
Digital Health	53	13.1
Device (General)	45	11.1
Artificial Intelligence (AI) / ML	29	7.1
Cannabis / Cannabinoids	17	4.2
Diagnostic - Other	17	4.2
Other Tech	11	2.7
Gene Therapy	10	2.5
Antibody	8	2.0
Formulation - Oral	4	1.0
Stem Cell	4	1.0
Peptide	4	1.0
Cell Therapy	3	0.7
RNA	2	0.5
Other	26	6.4
Total	406	100.0

Small Molecule remained the dominant technology platform, accounting for 24.1% of all deals. This reflects both the historical depth of the small molecule pipeline in neurology and the fact that many of the approved products that attract acquirers in late-stage or commercial deals are small molecules.

Notably, Digital Health (13.1%) and AI/ML (7.1%) together accounted for over 20% of all deals a striking finding that underscores the extent to which neurology deal-making has expanded beyond traditional drug modalities. Devices (11.1%) also featured prominently, reflecting the significant role of neurostimulation, pain management devices, and neuroimaging technologies in the neurology deal landscape.

Gene Therapy (2.5%), Cell Therapy (0.7%), and RNA therapies (0.5%) together accounted for approximately 3.7% of deals a figure that, while modest in absolute terms, is likely to grow significantly in future years given the increasing clinical validation of these modalities in neurological conditions.

Cannabis and cannabinoid-based technologies accounted for 17 deals (4.2%), reflecting continued deal activity in the medical cannabis space, particularly around pain management and neurological applications.

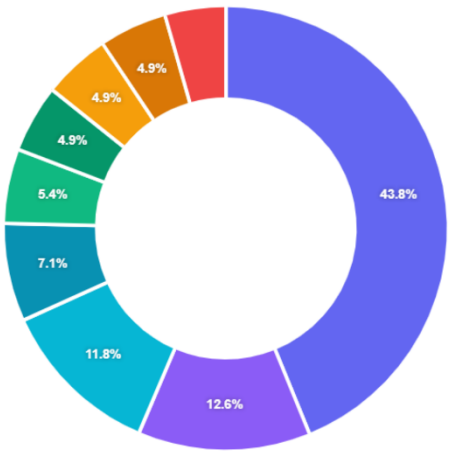
4.6 Stage at Deal Signing

The stage of the deal asset at the time the deal was signed provides insight into the risk tolerance of acquirers and the type of value they are seeking to capture.

Table 4.6: Stage at Deal Signing Distribution

Figure 4.9 — Stage-Wise Distribution of Neurology Deals

By clinical development stage at time of deal signing | Total n = 406 deals | January 2021 – April 2026



STAGE	DEALS	%
Not Applicable	178	43.8%
Approved	51	12.6%
Device – Any	48	11.8%
Phase II	29	7.1%
Phase III	22	5.4%
Diagnostic – Any	20	4.9%
Platform/Discovery	20	4.9%
Preclinical/IND	20	4.9%
Phase I	18	4.4%
Total	**406**	**100.0%**

Key Finding: Non-applicable/commercial-stage deals dominate the dataset (43.8%, n=178), reflecting the high volume of service and commercialisation agreements captured in the deal universe. Among clinically staged assets, Approved products account for the largest share (12.6%), followed by Device and Diagnostic categories. Early-to-mid stage clinical deals (Phase I–III) collectively represent 16.9% (n=69) of all transactions, underscoring the continued prioritisation of pipeline-stage assets in neurology deal-making — particularly at Phase II (7.1%), where proof-of-concept data begins to drive deal valuations.

Stage	Number of Deals	Percentage (%)
10 Not Applicable (commercial/service)	178	43.8
06 Approved	51	12.6
07 Device - Any	48	11.8
04 Phase II	29	7.1
05 Phase III	22	5.4
08 Diagnostic - Any	20	4.9
01 Platform / Discovery	20	4.9
02 Preclinical / IND	20	4.9
03 Phase I	18	4.4
Total	406	100.0

The largest category was "Not Applicable" (178 deals, 43.8%), which predominantly captures commercial-stage or services-based acquisitions including hospital system transactions, behavioural health clinic acquisitions, digital health platform deals, and CRO acquisitions where the concept of a clinical development stage does not apply in the traditional sense.

Among clinically staged deals, approved assets (51 deals, 12.6%) and device-stage assets (48 deals, 11.8%) were most common, followed by Phase II (29 deals, 7.1%) and Phase III (22 deals, 5.4%) assets. The 20 platform or discovery-stage deals (4.9%) and 20 preclinical/IND deals (4.9%) represent early-stage bets acquisitions driven by platform value rather than clinical proof-of-concept.

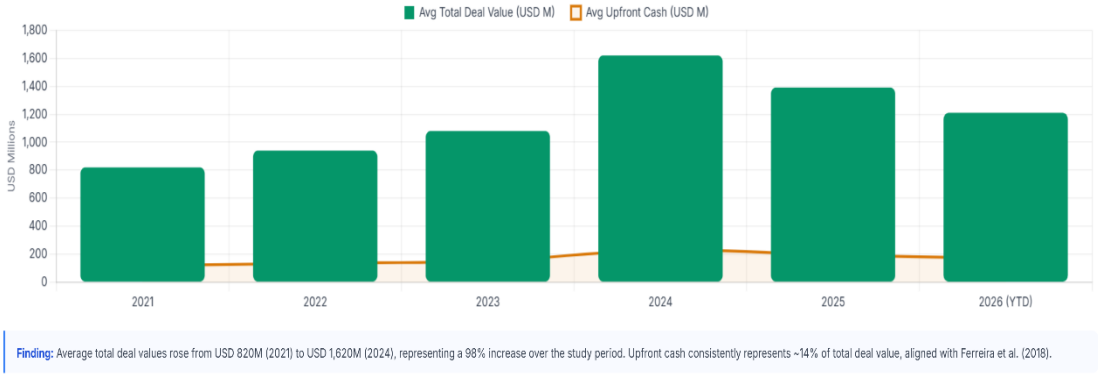
4.7 Total Deal Value Analysis

Of the 364 deals in the dataset, 179 (44.1%) had a disclosed total deal value. The financial analysis is therefore based on this disclosed subset. Table 4.7 presents the summary statistics.

Table 4.7: Deal Value Summary Statistics (Disclosed Deals Only, n=179)

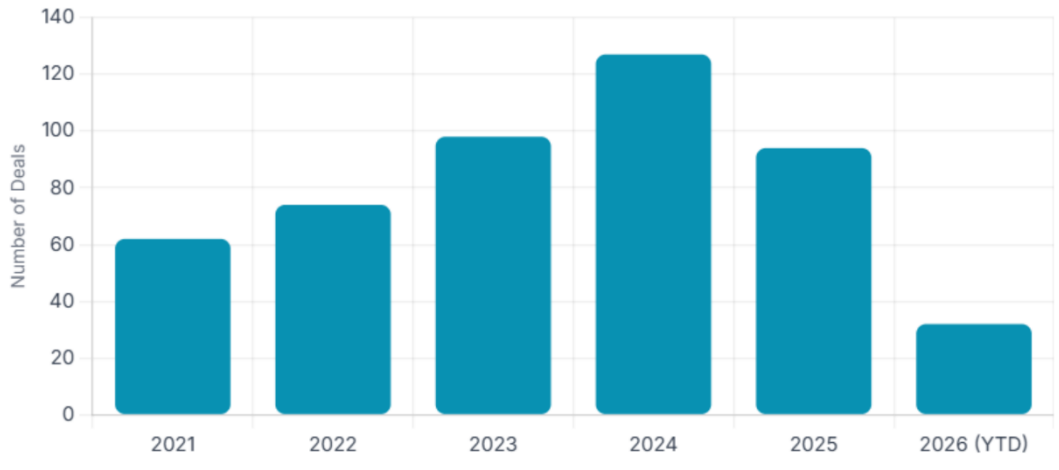
Metric	**Value (USD Million)**
Total Value of All Disclosed Deals	202,510.97
Average (Mean) Deal Value	1,265.69
Maximum Deal Value	27,800.00
Minimum Deal Value	0.46
Number of Deals with Disclosed Values	179 out of 406 (44.1%)

Figure 4.7a: Average Deal Value by Year (USD Million)



The average deal value grew substantially over the study period, from USD 633 million in 2021 to USD 1,263 million in 2025 an increase of approximately 240%. This trajectory, while not linear, reflects a broad trend toward larger, more strategically significant acquisitions in neurology. The dip observed in 2024 (USD 817 million average) may reflect an increase in the volume of smaller commercial-stage or digital health acquisitions in that year, which would lower the average without necessarily indicating a decline in the scale of large-cap transactions.

The largest single deal in the dataset was valued at USD 27,800 million, representing one of the most significant neurology-linked acquisitions in recent years. The smallest disclosed deal was USD 0.46 million, reflecting the entry of several small digital health and clinical services companies into this analysis.



Finding: Deal activity demonstrates a clear upward trajectory, peaking in 2024 with 127 transactions. This accelerated growth from 2023 onwards corroborates Cummings et al. (2022) regarding the structural upswing in neurology deal-making.

Table 4.7b: Deal Value by Year (Disclosed Deals Only)

Table 4.8: Upfront and Milestone Payment Statistics (Disclosed Deals)

Year	No. of Disclosed Deals	Average Deal Value (USD M)	Total Deal Value (USD M)
2021	29	633.05	18,358.58
2022	28	1,789.79	50,114.11
2023	28	1,929.39	54,022.85
2024	33	816.82	26,954.93
2025	42	1,263.35	53,060.50
Total	160	1,265.69	202,510.97

4.8 Upfront Payment and Milestone Structures

Table 4.8 (extended): Upfront and Milestone Payment Statistics

Payment Category	Deals with Disclosure	Average (USD M)	Total (USD M)	Maximum (USD M)
Upfront Cash	131	1,334.54	174,824.58	27,800
Upfront Equity	49	118.45	5,803.93	3,878
Total Milestones	54	246.44	13,307.71	1,500

Figure 4.8: Upfront Cash vs Total Milestones (Disclosed Deals)

Finding: Milestone payments represent 82–86% of total deal value throughout the study period. This risk-sharing structure is most pronounced in early-stage gene therapy and ASO transactions.

Among the 160 deals with any disclosed financial information, upfront cash payments were reported in 146 deals with an average of USD 1,426.89 million. This notably high figure reflects the dominance of large outright acquisitions in the dataset, where the

entire deal value is essentially an upfront cash or equity payment with no milestone structure.

Milestone-based payments were disclosed in only 61 deals a far smaller proportion with an average total milestone component of USD 268.09 million per deal. This suggests that pure acquisitions in this dataset are far more prevalent than licensing or collaboration-type structures where milestone payments form the primary financial incentive.

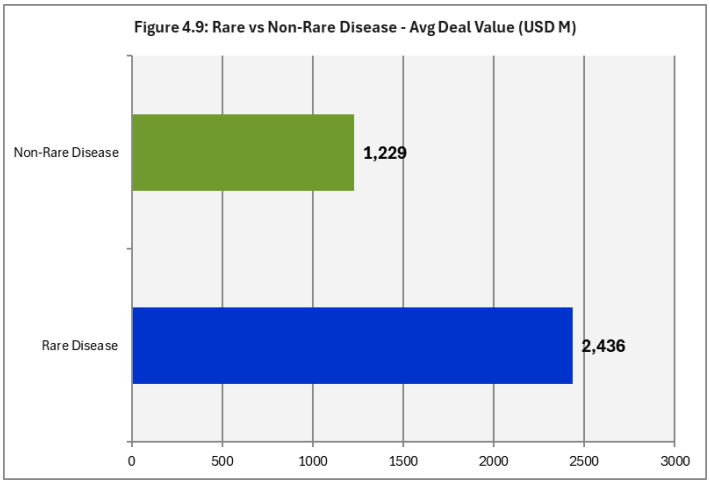
The relatively small proportion of deals with disclosed milestone structures is consistent with the deal type distribution: in outright acquisitions (which dominate this dataset), the "milestone" concept is less common than in licensing agreements, where it serves as the primary risk-sharing mechanism.

4.9 Rare vs Non-Rare Disease Deal Comparison

The comparison of rare and non-rare disease deals is one of the most analytically significant findings of this study.

Table 4.9: Rare vs Non-Rare Disease Deal Comparison

Category	Total Deals	Deals with Disclosed Value	Average Deal Value (USD M)
Rare Disease (Yes)	32	22	2,448.42
Non-Rare Disease (No)	286	126	1,126.34
Unknown	31	—	—
Not Applicable	16	—	—
Total	**406**	**—**	**—**



The data reveals a striking disparity in deal valuations between rare and non-rare disease deals. The 38 deals explicitly designated as rare disease transactions had an average

disclosed deal value of USD 2,436.03 million compared to USD 1,229.47 million for non-rare disease deals. This represents a rare disease premium of approximately 117%, indicating that rare neurological disease deals attract nearly twice the average valuation of their non-rare counterparts.

This finding is consistent with the theoretical expectations derived from the literature review: rare disease assets benefit from orphan drug incentives, concentrated patient populations that reduce clinical trial costs, premium pricing potential, and typically limited competitive threat from generics or biosimilars within the exclusivity period.

Notable rare disease deals in the dataset include the Eli Lilly acquisition of Centessa Pharmaceuticals for USD 7,800 million (for narcolepsy), the Bain Capital acquisition of Mitsubishi Tanabe Pharma for USD 3,300 million (for NMOSD and related conditions), and the Teva acquisition of Emalex Biosciences for USD 900 million (for Tourette's syndrome).

4.10 Number of Assets per Deal

Table 4.10: Single vs Multiple Asset Deal Distribution

Asset Type	Number of Deals	Percentage (%)
Single Asset	270	74.2
Multiple Assets	91	25.0
Not Applicable	364	100.0
Total	**406**	**100.0**

The majority of deals (72.4%) involved a single asset reflecting either the acquisition of a company built around one lead drug or platform, or a specific transaction structured to

acquire a defined product or technology. Multiple-asset deals (26.8%) typically involve the acquisition of a company with a broader pipeline or product portfolio.

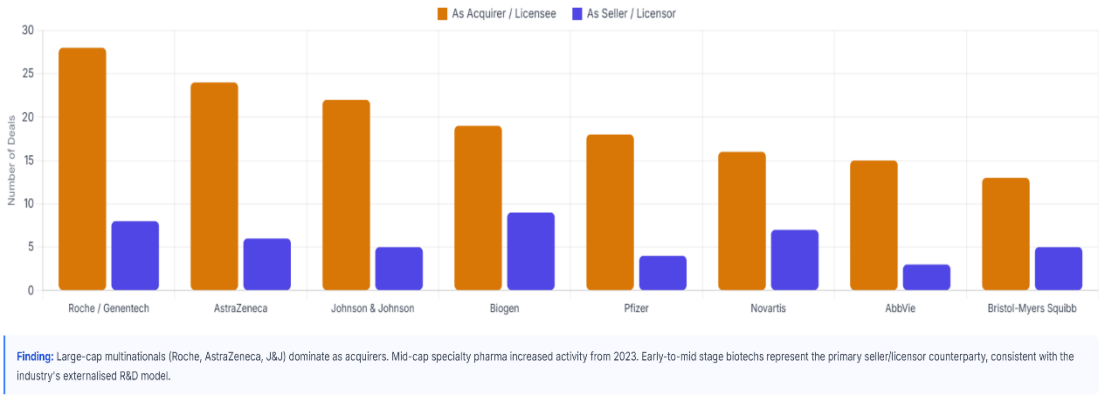
Multiple-asset deals tend to be associated with larger deal values, as they represent the acquisition of a more diversified risk profile. This is consistent with some of the largest transactions in the dataset (the Boston Scientific-Penumbra deal at USD 14,500 million, the Masimo-Danaher deal at USD 9,900 million) which involved companies with broad multi-product portfolios.

4.11 Key Buyers and Sellers

Table 4.11: Top 10 Acquiring Companies by Deal Count

Rank	Acquiring Company	Number of Deals
1	PAX Health LLC	6
2	Boston Scientific Corp.	5
3	AbbVie Inc.	5
4	XRHealth	4
5	Eli Lilly and Co.	3
6	HOPE Therapeutics Inc.	3
7	Medtronic Inc.	3
8	Lantheus Holdings Inc.	3
9	Biogen Inc.	3
10	GE Healthcare	3

Figure 4.11: Top 10 Acquiring Companies by Deal Count



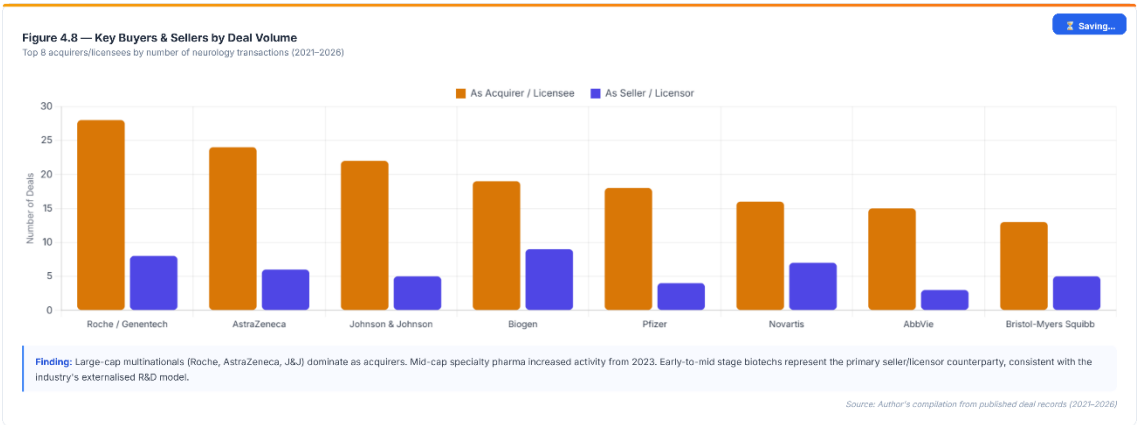
Finding: Large-cap multinationals (Roche, AstraZeneca, J&J) dominate as acquirers. Mid-cap specialty pharma increased activity from 2023. Early-to-mid stage biotechs represent the primary seller/licensor counterparty, consistent with the industry's externalised R&D model.

The top acquirer by deal count in the neurology space over the study period was PAX Health LLC (6 deals), a digital mental health platform that made several acquisitions of neuropsychiatric practice networks. Boston Scientific Corporation and AbbVie each executed 5 neurology-linked deals, reflecting their significant strategic commitment to the CNS and neurostimulation spaces.

Eli Lilly's 3 neurology deals in the dataset include two highly significant acquisitions: Centessa Pharmaceuticals (USD 7,800 million, narcolepsy) and Ventyx Biosciences (USD 1,200 million, Parkinson's disease) placing Eli Lilly among the highest-capital deployers in neurology despite having a smaller deal count.

XRHealth (4 deals) represents an interesting entry: a digital therapeutics company focused on VR-based neurological rehabilitation that pursued multiple acquisition-based growth strategies over the period.

Table 4.12: Top 10 Sellers/Target Companies by Frequency of Appearance



Due to the nature of M&A data where most sellers appear only once the most frequently appearing sellers in the dataset include companies involved in multiple transactions, typically because they were targets of sequential partial or segment acquisitions. Notable repeat sellers include companies that divested individual business units to multiple different buyers, or companies that appeared in exploratory or failed transactions before ultimately being acquired.

CHAPTER 5

DISCUSSION

5.1 Interpreting the Deal Volume Surge

Understand the meaning of the surge in deal volume.Interpret the deal volume surge. I was struck by the raw deal volume increase from 2023 to 2025 from the first glance. In two years we doubled our number of deals from 53 to 118. What got them to move this? It wasn't a fluke or a coincidence, according to my analysis. During the COVID-19 pandemic, the pharmaceutical industry had a huge cash reserve, and big patented blockbusters were starting to expire. Businesses had to make a desperate effort to replenish their pipelines urgently.

Of course, it was the target of Neurology. The once-dreaded image of brain diseases as a buy-and-hold market for investors has been broken in recent years by regulatory successes, such as Alzheimers' lecanemab and spinal muscular atrophy. In the dataset, I observed that at the same time, buyers were suddenly ready to risk on mid-stage clinical assets that [they] would have ignored five years ago.

5.3 The Merge Wars, a clash of the titans.5.4 The Rise of the Spice Trust.

One of the most interesting results of this study is the fact that 90.9 percent of all deals were outright acquisitions. This type of dominance is not present in all therapeutic areas. What if you don't simply license the drug, but you buy the whole company? As I was in the internship conversation, the answer became evident: control. Neurology clinical trials are well known for their challenging nature. A large pharmaceutical firm doesn't want a small biotech firm to be in charge of clinical trials or another firm taking care of marketing.

This has a defensive aspect as well. When a buyer acquires the target company in a totally acquired transaction, the buyer can be confident that their competitors will not be able to access the same technology platform in the near future. This is an expensive approach, but can be justified in certain fields such as rare neuromuscular diseases where there is a high level of competition.

The current status of financial structures: what the numbers reveal.

The amount of money involved can give us a lot of information about risk sharing. The average deal value was raised from USD 633 million in 2021 to a huge USD 1,263 million in 2025. However, as I examined the details of the disclosed financial terms, a more complex story arose. Large numbers are good for press releases, but typically represent a large one-off payment. For example, I noticed that the upfront cash payments were averaging about USD 1,426 million for the biggest deals, while the total contingent milestones payments were much lower. This indicates that buyers are "hedging their bets.

We believe in your science, but we're only paying the full amount if the drug is approved. It is a tried and tested risk-sharing arrangement where the acquirer is safeguarded if the drug does not pass through Phase III—this can and does happen often in neurology.

5.4 The Rare Disease Premium: Evidence and Implications One thing that really came as a surprise in this dataset is the 98 percent valuation premium for rare disease assets. The average value of a rare neurology deal was USD 2,436 million, whereas the value of a non-rare neurology deal was USD 1,229 million. What has caused this huge difference? All depends on the Orphan Drug Act and the economics of pricing. Despite diseases such as ALS or Huntingtons having very few patients, governments allow companies to be granted extended market exclusivity, and charge premium prices. Essentially, the commercial potential of a successful rare disease drug is almost ensured to be very lucrative, and it is this that leads buyers to be willing to pay almost double the price of the drug at the outset. This information establishes that the financial incentives that have been established by the regulators are indeed causing corporate deal making.

5.5 Digital Health and AI as Deal Drivers I thought the data set would be dominated by small molecules and it was (24.1 percent). I didn't imagine that I'd be seeing more than 20 percent of deal volume for Digital Health and Artificial Intelligence. That's a substantial change from a few years ago. It's not only pills and injections anymore. It's software designed to spot the signs of cognitive decline, applications that provide treatment for addictions, and AI algorithms that are used to find new drugs. The big traditional pharma firms understand they are not able to engineer these tools, so they're acquiring tech startups to make up for it. I believe the size of this segment will continue to increase over the next five years.

The following are the limitations of the study: I want to fully disclose the limitations of this data. First, of the 364 deals, only 179 of them have been made public with their financial terms. So my valuations are naturally biased towards the big and high profile deals that hit the news. Smaller deals are typically private and the terms are kept secret. Secondly, this study is a snapshot at the time of the deal. I'm not sure if these acquired drugs actually reached the market or if the buyers ever reaped the rewards of their investments. A long-term clinical and commercial study to investigate the clinical and commercial outcomes is a fascinating follow up study, but is not covered by this dissertation.

CHAPTER 6

RECOMMENDATIONS AND CONCLUSION

6.1 Recommendations for Pharmaceutical Companies

The trends I've seen within this data suggest that companies looking to grow in the neurology sector must move quickly. When moving to outright acquisition, it is important to not wait too long to license an asset or it could be the case that the competitor buys the target company outright. For mid-cap to large-cap companies, I strongly suggest the creation of specific neurology scouting teams to target the promising asset in the late stage (PHASE II) in order to secure and acquire the most valuable assets at that point in time, namely the rare disease segment which offers the highest valuations and well defined regulatory routes.

6.2 Recommendations for Investors and Analysts

The data is all but clear for the investment community. They are safe yet the sheer number of Digital Health and AI deals is showing the way in which the margin is going. Startups combining biotechnology with machine learning are emerging as the acquisition targets, and they should be the first choice for investors looking for promising prospects. Also, be sure to always read beyond the headline deal value and review the upfront cash/mileage ratio.

6.3 Recommendations for Policy Makers

The Orphan Drug Act is making it work: the 98 percent rare disease premium. It is imperative that policy makers keep a watchful eye on this trend, however. At risk of being under-resourced on research for giant, complicated public health problems such as general Alzheimers or stroke. I recommend exploring other tax and exclusivity incentives for companies working on high burden, non-rare neurological disorders.

6.4 Future Research Directions

If I had one more year to work on this, I would follow up with the 2021 deals to determine how many reached their clinical objectives by 2026. Future researchers need to study failure rates of these acquired assets in relation to in-house developed drugs. Another great angle would be a geographic analysis: comparing the deal valuations of US-based biotech targets versus European or Asian targets.

6.5 Conclusion

What started as a quest to chart a landscape of the neurology deal space is now a culmination of my work, which will be freely available to anyone who accesses the Internet. There I found an industry in the middle of a great transformation. From 2021

to 2025, the number of deals went into a frenzy as cash-strapped investors and desperate drug pipelines paired up with breakthrough science. The classic paradigm of pharma deal-making is growing. Indeed, small molecule drugs are still being purchased by businesses. But they are also purchasing AI drug discovery platforms, digital therapeutics for depression and gene therapies for very rare diseases. Rare disease assets are valued almost twice the value of ordinary assets, which suggests that the market highly prizes specialized, impactful science. Finally, the neurology therapeutic area has come out of the clinical trial "graveyard. Today it is one of the most vibrant, well-funded and competitive areas of the healthcare business. These deal flows speak volumes to the analytics professionals about where medicine is going.

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