

INTERDISCIPLINARY

Desafios do Enfermeiro no
Manejo e Prevenção do...

The use of Age at Death in
Field Epidemiology...

Difficulty in Diagnosing
Schizoaffective Disorder...

The Business Case for
Dementia-Competent
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Discovering Thoughts, Inventing Future

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PREFACE

The Global Journal of Medical Research (GJMR) is pleased to present this issue, bringing together a curated collection of high-quality research papers that explore the latest advances in medical science and clinical practice.

This issue features research spanning topics including neurology, pharmacology & drug discovery, microbiology & pathology, radiology & diagnostics, gynecology, diseases, veterinary science, orthopedics, surgery & cardiovascular medicine, dentistry, nutrition, and interdisciplinary medical studies. Each paper has undergone a rigorous double-blind peer-review process to ensure clinical rigor and scientific originality.

We would like to express our sincere gratitude to the authors for entrusting their research with us, to the reviewers for their thorough and constructive evaluations, and to our readers for their continued engagement with the medical scientific discourse.

We hope that the research presented herein inspires further inquiry and contributes meaningfully to the advancement of medical knowledge and patient care.

The Chief Editor
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Desafios do Enfermeiro no Manejo e Prevenção do Diabetes Mellitus Tipo 2: Uma Análise Epidemiológica e Clínica

Challenges of Nurses in the Management and Prevention of Type 2 Diabetes Mellitus: An Epidemiological and Clinical Analysis

Article Record

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PEER REVIEW

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Abstract

Type 2 Diabetes Mellitus (T2DM) is one of the most globally impactful non-communicable chronic diseases of our time, requiring continuous and multidisciplinary approaches. This study aims to analyze the main challenges faced by nurses in the management and prevention of T2DM, articulating with updated global and Brazilian epidemiological data. The methodology consisted of qualitative descriptive research, based on a literature review scientific articles and recent epidemiological reports (2021–2025). Results indicate that global diabetes prevalence reaches 589 million adults, with projections of 853 million by 2050, significantly affecting the population over 65 years of age. In Brazil, more than 16 million adults live with the disease. Nursing challenges focus on therapeutic adherence, health education for self-care, sociocultural barriers, and management of micro and macro vascular complications. It is concluded that the nurse's role is indispensable in Primary Health Care, requiring continuous training and innovative strategies to mitigate the impacts of T2DM on public health.

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No generative AI was used for analysis or results.

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The authors declare no conflict of interest.

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METADATA CONTINUATION

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ARCHIVAL RECORD

Desafios do Enfermeiro no Manejo e Prevenção do Diabetes Mellitus Tipo 2: Uma Análise Epidemiológica e Clínica

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Abstract

O Diabetes Mellitus tipo 2 (DM2) é uma das doenças crônicas não transmissíveis de maior impacto global na atualidade, exigindo abordagens contínuas e multidisciplinares. O presente estudo tem como objetivo analisar os principais desafios enfrentados pelo enfermeiro no manejo e na prevenção do DM2, articulando com dados epidemiológicos mundiais e brasileiros atualizados. A metodologia empregada consistiu em uma pesquisa qualitativa, descritiva, baseada em revisão de literatura de artigos científicos e relatórios epidemiológicos recentes (2021–2025). Os resultados apontam que a prevalência global do diabetes atinge 589 milhões de adultos, com projeções de 853 milhões até 2050, afetando expressivamente a população acima de 65 anos. No Brasil, mais de 16 milhões de adultos convivem com a doença. Os desafios da enfermagem concentram-se na adesão terapêutica, na educação em saúde para o autocuidado, nas barreiras socioculturais e no manejo das complicações micro e macro vasculares. Conclui-se que a atuação do enfermeiro é indispensável na Atenção Primária à Saúde, demandando capacitação contínua e estratégias inovadoras para mitigar os impactos do DM2 na saúde pública.

Keywords: *Diabetes Mellitus Tipo 2, Enfermagem, Atenção Primária à Saúde, Epidemiologia, Autocuidado*

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1. Introdução

O Diabetes Mellitus (DM) constitui um dos maiores problemas de saúde pública do século XXI, caracterizando-se como uma doença crônica não transmissível (DCNT) de origem multifatorial, resultante de defeitos na secreção ou na ação da insulina, o que culmina em hiperglicemia crônica (WORLD HEALTH ORGANIZATION, 2024). Dentre as suas classificações, o Diabetes Mellitus tipo 2 (DM2) é o mais prevalente, correspondendo a cerca de 90% a 95% de todos os casos diagnosticados. A patogênese do DM2 está intrinsecamente associada a fatores demográficos, socioeconômicos e comportamentais, tais como o envelhecimento populacional, a urbanização desordenada, o sedentarismo e o aumento expressivo nas taxas de sobrepeso e obesidade (INTERNATIONAL DIABETES FEDERATION, 2025).

No cenário global, a expansão do DM2 tem assumido proporções epidêmicas. Segundo a 11ª edição do Atlas de Diabetes da Internacional Diabetes Federation (IDF) de 2025, aproximadamente 589 milhões de adultos, na faixa etária de 20 a 79 anos, vivem com diabetes no mundo, o que representa 11,1% da população adulta global (IDF, 2025). As projeções são alarmantes, estimando-se que esse número alcance 853 milhões até 2050. Um dado preocupante é que cerca de 252 milhões de pessoas desconhecem o seu diagnóstico, o que atrasa o início do tratamento e eleva o risco de complicações severas (IDF, 2025). Esse fenômeno é particularmente grave nos países de baixa e média renda, onde residem mais de 80% dos indivíduos afetados, e onde o acesso a serviços de diagnóstico e tratamento ainda é profundamente desigual.

A prevalência do diabetes apresenta variações significativas conforme a faixa etária. A doença afeta desproporcionalmente os idosos, sendo que a maior taxa de prevalência é observada no grupo de 75 a 79 anos, atingindo 24,8% em 2024. Estima-se que um em cada quatro adultos com diabetes, o que corresponde a 158 milhões de pessoas, tenha mais de 65 anos (MAGLIANO; BOYKO, 2025). Esse perfil etário impõe desafios adicionais ao manejo clínico, uma vez que pacientes idosos frequentemente apresentam múltiplas comorbidades, polifarmácia, declínio cognitivo e maior vulnerabilidade a hipoglicemias. A Tabela 1 apresentada na seção de resultados detalha esses indicadores, evidenciando a distribuição etária da doença e a magnitude do problema.

No Brasil, o cenário reflete a tendência mundial e assume contornos ainda mais preocupantes. Dados da IDF (2024) apontam que o país possui mais de 16,6 milhões de adultos com diabetes, com uma prevalência nacional de 10,6%, o que o posiciona entre os países com maior número absoluto de casos no mundo (IDF, 2024). A Sociedade Brasileira de Diabetes (SBD) destaca que a prevalência nacional estimada é de 7,6% pela metodologia do Teste Oral de Tolerância à Glicose (TOTG), podendo atingir 9,4% quando combinada com critérios de HbA1c e diabetes autor referido, com cerca de 50% dos casos sem diagnóstico estabelecido (SBD, 2024). As altas taxas de morbimortalidade associadas às complicações da doença evidenciam falhas no controle glicêmico de grande parte dos pacientes atendidos no sistema público de saúde. A taxa de mortalidade padronizada por idade em indivíduos com diabetes no Brasil é 57% maior do que na população geral, um indicador que

revela a gravidade das consequências de um manejo inadequado (SBD, 2024).

A carga global do diabetes não se limita às dimensões clínicas. O impacto econômico da doença é igualmente devastador. Em 2024, os gastos globais com diabetes superaram 1 trilhão de dólares americanos, correspondendo a 12% de todo o gasto em saúde no mundo (IDF, 2025). No Brasil, os custos hospitalares decorrentes de complicações do diabetes representam um peso significativo para o Sistema Único de Saúde (SUS), com as doenças cardiovasculares respondendo por cerca de 50% das hospitalizações relacionadas à doença (SBD, 2024). Esse cenário reforça a urgência de estratégias preventivas e de manejo eficaz, que possam reduzir as internações e melhorar a qualidade de vida dos pacientes.

Diante da complexidade e da cronicidade do DM2, o manejo efetivo transcende a mera prescrição medicamentosa, exigindo uma reestruturação profunda no estilo de vida do paciente e uma abordagem integral que contemple as dimensões biopsicossociais do adoecimento. É nesse contexto que a enfermagem desempenha um papel nuclear. Na Atenção Primária à Saúde (APS), o enfermeiro atua na linha de frente, sendo responsável pelo rastreamento, acompanhamento, educação em saúde e prevenção de complicações (CONSELHO FEDERAL DE ENFERMAGEM, 2025).

A proximidade do enfermeiro com o paciente e com a comunidade o coloca em uma posição privilegiada para identificar fatores de risco, promover mudanças comportamentais e articular o cuidado em rede. Contudo, a práxis da enfermagem no manejo do DM2 é perpassada por múltiplos desafios, que vão desde as limitações estruturais do sistema de saúde até a baixa adesão do paciente ao tratamento proposto. A sobrecarga de trabalho, a falta de insumos, as barreiras culturais e a ausência de programas de educação permanente específicos para o manejo do diabetes comprometem a qualidade do cuidado prestado (BRITO DE SOUSA et al., 2023).

Compreender esses desafios é, portanto, fundamental para a formulação de políticas públicas e estratégias de gestão que fortaleçam a atuação da enfermagem no enfrentamento desta epidemia silenciosa. A **pergunta norteadora** desta pesquisa é: Quais são os principais desafios enfrentados pelo enfermeiro na Atenção Primária à Saúde para promover o manejo eficaz e a prevenção de complicações do Diabetes Mellitus tipo 2, considerando o atual cenário epidemiológico global e nacional?

O **problema** investigado reside na lacuna existente entre o conhecimento científico sobre as diretrizes de tratamento do DM2 e a aplicação prática do autocuidado pelos pacientes, agravada por fatores socioeconômicos e deficiências na infraestrutura de saúde, que dificultam a atuação plena do enfermeiro como educador e promotor de saúde.

Assim, o presente artigo tem como objetivo analisar os principais desafios do enfermeiro no manejo e prevenção do diabetes tipo 2, articulando essa discussão com os dados epidemiológicos mundiais e brasileiros atualizados sobre a prevalência e a distribuição etária da doença, com vistas a contribuir para o aprimoramento da prática de enfermagem e para o fortalecimento das políticas de saúde voltadas ao DM2.

2. Metodologia

O presente estudo caracteriza-se como uma pesquisa qualitativa de cunho descritivo, operacionalizada por meio de uma revisão narrativa da literatura. A pesquisa qualitativa conforme aponta Minayo (2014), permite aprofundar a compreensão sobre os fenômenos e as dinâmicas que envolvem a prática assistencial, captando

a complexidade das relações humanas e institucionais que permeiam o cuidado em saúde.

A abordagem descritiva, por sua vez, visa detalhar as características epidemiológicas e os desafios clínicos inerentes ao manejo do DM2, sem a pretensão de estabelecer relações causais, mas de mapear e compreender o fenômeno em sua amplitude.

Para a construção do referencial teórico e epidemiológico, foram consultadas bases de dados científicas e portais oficiais de organizações de saúde nacionais e internacionais. A coleta de dados ocorreu no período de janeiro a maio de 2026, utilizando-se como fontes primárias: os relatórios atualizados da International Diabetes Federation (IDF Diabetes Atlas, 11ª edição, 2025), dados e diretrizes da Organização Mundial da Saúde (OMS/WHO), boletins e diretrizes da Sociedade Brasileira de Diabetes (SBD, 2024) e dados do Departamento de Informática do SUS (DATASUS).

Além dos dados epidemiológicos, realizou-se uma busca sistemática por artigos científicos publicados entre os anos de 2021 e 2025 nas bases de dados PubMed/MEDLINE, SciELO e LILACS (Literatura Latino-Americana e do Caribe em Ciências da Saúde). Os descritores utilizados, nos idiomas português e inglês, incluíram: "Diabetes Mellitus Tipo 2", "Enfermagem", "Atenção Primária à Saúde", "Epidemiologia", "Autocuidado", "Nurse-interventions" e "Diabetes management". O operador booleano AND foi utilizado para combinação dos descritores.

Os critérios de inclusão abrangeram estudos originais, revisões integrativas e narrativas, e diretrizes clínicas que abordassem a atuação do enfermeiro no manejo do DM2, os desafios na adesão ao tratamento, as complicações da doença e as estratégias educativas em saúde. Foram excluídos estudos que tratassem exclusivamente do Diabetes Mellitus tipo 1, estudos com populações pediátricas (exceto quando em comparação com adultos) e publicações anteriores a 2021, salvo quando de relevância histórica comprovada. Os dados foram analisados criticamente e categorizados em eixos temáticos para a composição dos resultados e discussões, seguindo os princípios da análise de conteúdo temática.

3. Resultados e Discussão

3.1. Panorama Epidemiológico Atual do Diabetes Mellitus

A análise dos dados epidemiológicos recentes revela a magnitude do Diabetes Mellitus como uma emergência de saúde global. A Tabela 1 sintetiza os principais indicadores globais e nacionais da doença, evidenciando a escala do problema e a urgência de respostas coordenadas dos sistemas de saúde.

A distribuição etária do DM2 é um fator crítico para o planejamento das ações de saúde. A prevalência aumenta substancialmente com a idade, refletindo o impacto cumulativo de fatores de risco ao longo da vida. Segundo Magliano e Boyko (2025), a prevalência global é mais baixa entre adultos de 20 a 24 anos (1,9%) e atinge seu pico entre os 75 e 79 anos (24,8%). O envelhecimento populacional é, portanto, um dos principais motores do aumento de casos, exigindo que os sistemas de saúde estejam preparados para manejar pacientes geriátricos com DM2, que frequentemente apresentam múltiplas comorbidades, polifarmácia, maior risco de hipoglicemia e necessidade de abordagens terapêuticas individualizadas.

A Tabela 2 apresenta a distribuição da prevalência do DM2 por faixa etária, conforme dados do IDF Diabetes Atlas 11ª edição (2025), ilustrando o padrão de crescimento exponencial da doença com o avançar da idade.

No Brasil, o cenário é igualmente desafiador. O país ocupa posições de destaque no ranking global de número de pessoas com diabetes. Dados da SBD (2024) indicam que a prevalência nacional varia

Indicador	Dados Globais (IDF 2025)
Prevalência em Adultos (20–79 anos)	589 milhões (11,1%)
Projeção para 2050	853 milhões (13%)
Casos Não Diagnosticados	252 milhões (aprox. 43%)
Faixa Etária de Maior Prevalência	75–79 anos (24,8%)
Adultos com DM acima de 65 anos	158,3 milhões (23,7%)
Impacto Financeiro (Gastos em Saúde)	> 1 Trilhão USD (12% do total global)
Mortalidade Associada	> 3,4 milhões de mortes em 2024
Residentes em Países de Baixa/ Média Renda	81% dos casos

Indicador	Dados do Brasil (IDF 2024 / SBD)
Proporção crescente Aprox. 50% dos casos Acima de 65 anos	16,6 milhões (10,6%)
Adultos com DM acima de 65 anos	24,0 milhões
Impacto Financeiro (Gastos em Saúde)	Alto impacto no SUS (internações)
Residentes em Países de Alta/ Média Renda	57% maior que na população geral

Table 1. Principais indicadores globais e nacionais do Diabetes Mellitus

Fonte: Elaborado pelo autor com base nos dados da IDF (2025), Magliano e Boyko (2025) e SBD (2024).

Faixa Etária (anos)	Prevalência Global Estimada (2024)	Projeção para 2050 2,2%
20–24	1,9%	Crescente
25–34	Aprox. 3–4%	Crescente
35–44	Aprox. 6–7%	Crescente
45–54	Aprox. 12–14%	Crescente
55–64	Aprox. 18–20%	Crescente
65–74	Aprox. 22–24%	Crescente
75–79	24,8%	25,4%
65–99 (total)	158,3 milhões (23,7%)	278 milhões

Table 2. Prevalência Estimada do Diabetes por Faixa Etária (2024)

Fonte: Adaptado de Magliano e Boyko (2025) – IDF Diabetes Atlas, 11ª edição.

de 7,6% a 10,6%, com variações regionais significativas, sendo o Sudeste a região com maior prevalência (12,8%) e o Norte a de menor (6,3%) (MOREIRA et al., 2024). Além disso, a taxa de mortalidade específica por diabetes no Brasil saltou de 12,8 para 30,2 mortes por 100 mil habitantes entre 1992 e 2019, refletindo as graves consequências das complicações não controladas (SBD, 2024). O controle glicêmico inadequado é um problema prevalente: estudo com 5.750 pacientes atendidos no SUS demonstrou que apenas 26% atingiam HbA1c inferior a 7%, meta considerada adequada para a maioria dos pacientes (SBD, 2024).

A análise de Zhou et al. (2024), publicada no periódico The Lancet, reforça a dimensão global do problema, demonstrando que a prevalência do diabetes em adultos dobrou de 7% para 14% entre 1990 e 2022, com os países de baixa e média renda experimentando os maiores aumentos. Em 2022, aproximadamente 450 milhões de adultos com 30 anos ou mais permaneciam sem tratamento, representando 59% de todos os adultos com diabetes, um aumento de 3,5 vezes em relação a 1990 (ZHOU et al., 2024).

3.2. O Papel do Enfermeiro e os Desafios no Manejo do DM2

A Atenção Primária à Saúde (APS) é o lócus prioritário para o acompanhamento do paciente com DM2. Nesse nível de atenção,

o enfermeiro assume um protagonismo inquestionável. As intervenções de enfermagem abrangem a consulta clínica, a solicitação e avaliação de exames conforme protocolos locais, o rastreamento do pé diabético, a estratificação de risco cardiovascular e, fundamentalmente, a educação em saúde (COFEN, 2025). O enfermeiro é, muitas vezes, o primeiro e o principal ponto de contato do paciente com o sistema de saúde, o que lhe confere uma responsabilidade singular na detecção precoce e no acompanhamento longitudinal da doença.

Apesar da importância comprovada de sua atuação, o enfermeiro enfrenta uma série de desafios complexos no manejo diário do DM2, que podem ser agrupados em quatro grandes eixos:

Primeiro eixo – Adesão Terapêutica e Mudança de Estilo de Vida

O tratamento do DM2 exige um engajamento ativo do paciente em práticas de autocuidado, como reeducação alimentar, prática regular de atividade física e adesão medicamentosa, seja com antidiabéticos orais, seja com insulinoterapia. O maior desafio do enfermeiro é promover a mudança comportamental em pacientes que, muitas vezes, possuem baixa escolaridade, crenças limitantes sobre a doença e restrições socioeconômicas que dificultam o acesso a alimentos saudáveis e a espaços de lazer. A educação em saúde não pode ser meramente transmissiva, deve ser dialógica, culturalmente sensível e adaptada à realidade do paciente (BRITO DE SOUSA et al., 2023). Estudos demonstram que uma abordagem individual, em comparação a uma abordagem grupal, tende a ser mais eficaz para a mudança de comportamento em pacientes com DM2 (DAILAH, 2024).

Segundo eixo – Manejo das Complicações Crônicas

A hiperglicemia sustentada leva a complicações microvasculares, incluindo retinopatia, nefropatia e neuropatia, e macrovasculares, como doença isquêmica do coração, doença cerebrovascular e doença arterial periférica (MINISTÉRIO DA SAÚDE, 2023). A neuropatia diabética, combinada com problemas arteriais, é a principal causa do “pé diabético” e de amputações não traumáticas, que representam um impacto devastador na qualidade de vida do paciente.

O enfermeiro enfrenta o desafio de realizar o rastreamento precoce dessas complicações em um cenário de tempo de consulta reduzido e, por vezes, de escassez de insumos básicos, como monofilamentos para teste de sensibilidade, nas Unidades Básicas de Saúde (COFEN, 2025). A prevenção do pé diabético, por exemplo, exige um protocolo sistematizado de avaliação que nem sempre está disponível ou é aplicado de forma consistente na APS.

Terceiro eixo – Falta de Reconhecimento e Sobrecarga de Trabalho

Embora os enfermeiros sejam os profissionais que passam mais tempo com os pacientes e sejam frequentemente apontados como melhores ouvintes e mais empáticos no cuidado do diabetes (DAILAH, 2024), seu papel na gestão autônoma da doença muitas vezes não é plenamente reconhecido pelos sistemas de saúde. A sobrecarga de trabalho, a alta demanda de atendimentos e a falta de capacitação continuada específica para o manejo do diabetes dificultam a prestação de um cuidado holístico e individualizado. A ausência da figura do Enfermeiro Especialista em Diabetes (Diabetes Inpatient Specialist Nurse – DISN) em muitas realidades brasileiras é um reflexo dessa lacuna (DAILAH, 2024). Estudos apontam que em 22% dos hospitais ainda não há enfermeiros especialistas em suas unidades e muitos deles não estão totalmente dedicados e informados sobre esses cuidados, comprometendo a qualidade do cuidado intra-hospitalar (DAILAH, 2024).

Quarto eixo – Barreiras Sistêmicas e Estruturais

A dificuldade de acesso a medicamentos, insumos para monitoramento glicêmico capilar e encaminhamento para especialistas, como endocrinologistas e oftalmologistas, na rede pública geram frustração

tanto para o paciente quanto para o profissional. O enfermeiro atua como um articulador do cuidado, mas sofre com a fragmentação da rede de atenção à saúde e com a insuficiência de políticas de saúde que garantam a integralidade do cuidado ao paciente com DM2. Aldahmashi et al. (2024) destacam que a adesão dos enfermeiros às diretrizes clínicas de diabetes na atenção primária é frequentemente comprometida por fatores organizacionais e pela falta de suporte institucional.

3.3. Estratégias de Superação e Perspectivas para a Enfermagem

Para mitigar esses desafios, a literatura científica aponta a eficácia de intervenções lideradas por enfermeiros (nurse-led interventions). Programas estruturados de Educação para o Autocuidado em Diabetes (DSME – Diabetes Self-Management Education) conduzidos por enfermeiros têm demonstrado resultados significativos na redução dos níveis de Hemoglobina Glicada (HbA1c), na melhoria do conhecimento sobre a doença e na adoção de comportamentos saudáveis (DAILAH, 2024). Revisões sistemáticas demonstram que o grupo de pacientes que recebe educação e intervenção de enfermeiros especialistas apresenta níveis médios de glicose significativamente menores, tanto durante a internação quanto no acompanhamento ambulatorial pós-alta.

O uso de tecnologias de informação e comunicação, como o telemonitoramento, aplicativos de saúde e plataformas de educação à distância, também surge como uma ferramenta promissora para ampliar o alcance do cuidado de enfermagem, especialmente em regiões remotas ou com baixa cobertura de serviços especializados. Ibrahim et al. (2024) demonstraram que um program de intervenção de enfermagem de 16 semanas, focado no desenvolvimento de habilidades para o autogerenciamento do DM2, resultou em melhoras significativas nas estratégias de enfrentamento e na qualidade de vida dos participantes.

No contexto brasileiro, a Consulta de Enfermagem ao paciente com DM2 na APS, regulamentada pela Lei do Exercício Profissional de Enfermagem (Lei nº 7.498/1986) e respaldada pelas diretrizes da SBD (2023), representa um instrumento fundamental para o cuidado integral. A consulta de enfermagem permite a avaliação clínica sistematizada, identificação de fatores de risco, o estabelecimento de metas terapêuticas e o fortalecimento do vínculo terapêutico, elementos essenciais para a adesão ao tratamento (SBD, 2023). O fortalecimento dessa prática, aliado à implementação de grupos de educação em saúde e ao trabalho em equipe multiprofissional, constitui a base para um cuidado efetivo ao paciente com DM2 na APS.

4. Conclusão

O Diabetes Mellitus tipo 2 representa um desafio colossal para a saúde pública mundial e brasileira, impulsionado pelo envelhecimento da população e por mudanças nos padrões de vida associadas à urbanização e ao sedentarismo. Os dados epidemiológicos de 2024 e 2025 confirmam a escalada da doença, com 589 milhões de adultos afetados globalmente e mais de 16 milhões no Brasil, especialmente na faixa etária acima dos 65 anos, e um contingente alarmante de casos não diagnosticados que perpetua o ciclo de complicações e morbimortalidade elevada.

Neste cenário, o enfermeiro emerge como peça-chave no manejo e na prevenção da doença, atuando primordialmente na Atenção Primária à Saúde como educador, cuidador e articulador do cuidado integral. A proximidade com o paciente e com a comunidade confere ao enfermeiro uma posição estratégica única para a promoção da saúde e a prevenção de complicações do DM2. Contudo, a prática

profissional é perpassada por desafios substanciais, que incluem a dificuldade em garantir a adesão terapêutica, o manejo de complicações severas como o pé diabético, as limitações socioeconômicas dos pacientes e as deficiências estruturais do sistema de saúde.

Conclui-se que o enfrentamento do DM2 requer uma valorização efetiva do papel do enfermeiro, não apenas como executor de tarefas técnicas, mas como educador em saúde, gestor do cuidado e agente de transformação social. É imperativo o investimento em políticas públicas que garantam capacitação contínua, condições de trabalho adequadas e o fortalecimento de programas de educação para o autocuidado, visando reduzir a morbimortalidade e promover a qualidade de vida das pessoas que convivem com o diabetes. A implementação de modelos de cuidado liderados por enfermeiros, respaldados por evidências científicas robustas, representa uma das estratégias mais custo-efetivas para o enfrentamento desta epidemia global.

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The use of Age at Death in Field Epidemiology: Review of Data from the Seven Countries Study

Article Record

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Abstract

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The use of Age at Death in Field Epidemiology: Review of Data from the Seven Countries Study

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Abstract

Age at death (AD) is an old demographic metric recently re-evaluated. In field epidemiology it has been never used because in this case the study population must be extinct or nearly extinct. The research group of the Seven Countries Study of Cardiovascular Diseases was able to reach a follow-up that in most cases corresponds to the extinction of cohorts allowing to study the problem of AD. A review of published material, with focus on 7 selected detailed examples, describes and comments findings dealing with determinants of AD at individual levels, comparison of AD across different causes of death, ecological comparison across different cohorts and possible determinants of differences.

Keywords: *Age at death, determinants, field epidemiology, Seven Countries Study*

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1. Introduction

Age at death (AD) is an old metric recently re-evaluated [1, 2, 3, 4] and mainly used by demographers. It consists in a single number corresponding to the age when death occurs, expressed in years. There are some research areas that traditionally used AD. Many investigations are run by demographers who use AD as an important parameter to study the increasing longevity, exploiting the official national mortality registers and possibly try to find explanations [5, 6, 7, 8, 9, 10, 11, 12]. AD represents a descriptive parameter associated with the occurrence of sudden and unexpected death among infants, although the age limits are rather different and not comparable across the various studies [13, 14, 15, 16, 17, 18, 19, 20, 21, 22]. The same applies to research dealing with sudden and unexpected deaths among athletes and more in general associated with leisure sporting activity, and in this case AD is only a descriptive parameter [23, 24, 25, 26, 27, 28, 29, 30]. Finally, in forensic medicine AD has become an unknown target to be estimated using sophisticated technologies [31, 32, 33, 34, 35, 36, 37, 38].

Outside the above-mentioned research areas, AD can theoretically be useful in epidemiological population studies based on samples or cohorts (field epidemiology) examined once or in multiple occasions and followed-up for long periods of time in order to reach the extinction of the cohort or at least its quasi-extinction (when survivors are less than 10%). Otherwise, its meaning and interpretation are rather weak and distorting. Although survival models (such as Cox Proportional Hazards, Weibull models, or Kaplan-Meier estimation) are designed specifically for continuous time-to-event data, they were not applied to model AD itself in these studies. The primary reason is that the cohorts under study are fully extinct (or nearly extinct), meaning there is no

right-censoring, which simplifies the analysis of AD to ordinary least squares (OLS) linear regression. Simple linear regression is therefore feasible and appropriate due to the extinct nature of the cohorts, rather than survival analysis. In one of the original papers (reference [46]; Paper 1 in the Tabulation), a Cox proportional hazards model was indeed applied to all-cause mortality (using the same covariates) and reached rather similar findings. On the other hand, studies suitable for the use of AD in the area of field epidemiology seem extremely rare since population studies reaching this goal are extremely difficult and expensive to run and perhaps do not exist except some exceptions. When asking for AD in popular medical or health sciences bibliographic platforms [39, 40] the only available publications are related to the typologies mentioned above [5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38].

The research group of the Seven Countries Study of Cardiovascular Diseases (SCS) had the opportunity to extend the follow-up of their cohorts for long periods of time reaching in many cases 60 years, and at the same time observing the extinction of the cohorts. This allowed to compute at individual and ecological levels the AD and to use it for comparing duration of life as a whole and to look at possible determinants of AD. Moreover, it was used to compare different causes of death in order to describe the natural history of different diseases. Due to this lucky circumstance, we reviewed here a selected series of papers from the SCS reporting, summarizing and commenting some relevant data on AD only among those published so far [41, 42, 43, 44, 45, 46, 47].

2. Material and Methods

The SCS was started in 1958, with the enrollment of 16 cohorts of middle-aged men (ages 40-59, total 12,763) in seven countries,

i.e. USA, Finland, the Netherlands, Italy, two former Yugoslavia republics, (Croatia and Serbia), Greece, and Japan characterized by apparent contrasting eating habits. They included 10 rural communities, 1 fishing community, 4 varied occupational groups, 1 demographic sample from a Dutch town.

The entry examination included the collection of family and social data, lifestyle behaviors including smoking, physical activity habits, a series of anthropometric measurements, a few biochemical and biophysical measurements, diagnoses of major diseases obtained by a complex medical examination, recording of a resting and post-exercise electrocardiogram and resting spirometry measurements. A complex dietary survey was run in subsamples of each cohort, allowing the recording of many food-groups and the chemical measurement of basic nutrients in portions of food taken at home of the participants. Follow-up included at least 2 quinquennial field re-examinations, dedicated procedures to find data on incidence of major cardiovascular diseases, collection and coding of mortality data up to year 60 of follow-up in 10 cohorts (when practically extinct), and shorter follow-up in the other six. Mortality data were coded following defined rules and using the 8th Revision of the WHO International Classification of Diseases [48].

The main purpose of the study was to find whether there were true differences in the occurrence of major cardiovascular diseases (CVD) and mainly coronary heart diseases (CHD) across the various cohorts and to investigate whether such differences could

be explained by different life-style and mainly dietary habits. Major information on the study can be found in 5 monographs and several hundreds of papers.

The use of AD started in 2017-2028, first applied to the Italian Rural Areas (IRA), then extended to other cohorts. Analyses involving AD in the SCS are many but only those selected and systematically reviewed are quoted here [41, 42, 43, 44, 45, 46, 47]. The analyses included different approaches: 1) estimates of AD at individual level, derived from all-cause mortality accompanied by multivariate models where AD represents the dependent variable, and various personal characteristics and risk factors play the role of possible determinants and predictors; 2) in some cases, the end-point was made by AD for some major cardiovascular types of mortality; 3) in other analysis, estimates of mean levels of AD were computed for single cohorts or countries to examine possible differences and to explain them, in an ecologic approach, by overall cohort characteristics.

3. Results

Findings are reported in a few Tables that are self-explanatory being provided with selected numbers and words and dealing with 7 examples derived from quoted references [41, 42, 43, 44, 45, 46, 47]. In this case the six Tables stand individually in place of the traditional narrative Results chapter.

Table 1. Examples of AD in the Italian Rural Areas of the SCS (Paper 1).

PAPER 1	
Paper	Aging Clin Exp Res [46] Determinants of AD in Italian areas
Population	Italian Rural Areas of the SCS. Entry denominator: 1712 men aged 40-59 years
End-point and follow-up	All-cause mortality during 61 years in practically extinct cohorts
Models	Multiple linear regression with AD as end-point (dependent variable) and 35 independent variables measured at entry dealing with family and social data, lifestyle behaviors, anthropometric measurements, classical risk factors, clinical signs, major prevalent diseases
Variables directly related to AD in a significant way ($p < 0.05$)	Age, socio-economic status, marital status, vigorous physical activity, never smoking, Intermediate and Mediterranean Diets (versus not-Mediterranean Diet), subscapular skinfold, arm circumference, vital capacity
Variables inversely related to AD in a significant way ($P < 0.05$)	Mother early death, current smoker, not-Mediterranean Diet, shoulder/pelvis shape, laterality/linearity index, systolic blood pressure, serum cholesterol, corneal arcus, xanthelasma, cardiovascular diseases, cancer, diabetes, chronic bronchitis
Notes and conclusions	Many of the available possible determinants of AD do coexist in the same model despite the existence of some correlations among them. They represent several types of determinants and each of them contributes with a small number of gained or lost years that, when combined together, may result in many years difference in AD

Table 2. Examples of AD in the Italian Rural Areas of the SCS (Paper 2).

PAPER 2			
Paper	Aging Clin Exp Res [41] AD in different causes of death		
Population	Italian Rural Areas of the SCS. Entry denominator: 1712 men aged 40-59 years		
End-point and follow-up	All-cause mortality in 50 years of follow-up (survivors = 2.5%, quasi extinct cohort)		
Models	Proportions of different causes of death and median of AD		
Notes and Conclusions There is a great variation of median AD across some major causes of death. The most important finding is the large difference in AD across the 3 major Cardiovascular diseases, that is Coronary heart Disease, Heart Disease of Uncertain Etiology and Stroke that has suggested, together with other characteristics, that we are in front of 3 different diseases that should not be combined together in statistical analysis. The contribution to overall AD is particularly heavy on the side of Coronary Heart Disease due to its relatively low level and the large proportion of cases classified in this way.	Cause of death % over all causes and median AD		
	Causes of death	% over all causes	Median of AD
	Coronary heart disease	19.1	75
	Heart disease of uncertain etiology	9.7	80
	Stroke	13.5	76
	Peripheral artery disease	1.4	80
	Other cardiovascular diseases	2.1	68
	Lung cancer	4.6	76
	Other cancers	23.0	74
	Chronic bronchitis	3.4	71
	Infectious diseases	1.1	65
	Violent deaths	4.8	70
	Senility and cause unknown	7.4	86
	Other causes	10.4	72
	All causes	100.0	76

Table 3. Examples of AD in cohorts of the SCS.

PAPER 3	
Paper	Aging Clin Exp Res [42] All-cause death in 10 cohorts of the SCS
Populations	7047 men aged 40-59 year in 10 cohorts of 5 European countries (Finland, the Netherlands, Italy, Serbia, Greece)
End-point and follow-up	All-cause mortality and AD during 50 years of follow-up with 3% of survivors (almost extinct cohorts)
Tested determinants	38 variables of different nature (including 3 references): family, social, lifestyle behaviors, risk factors, some major prevalent diseases, identification of countries
Models	Several multiple linear regressions with the last one computed with a stepwise approach, AD as dependent variable, and 38 variables as possible determinants
Variables directly and significantly related with AD with $p < 0.05$	Age, socio-economic status, moderate and vigorous physical activity (versus sedentary habits), never smokers (versus smokers), arm circumference, subscapular skinfold, forced expiratory volume
Variables inversely and significantly related with AD with $p < 0.05$	Father early death, current smoker, laterality/linearity index, systolic blood pressure, serum cholesterol, major cardiovascular diseases, diabetes, chronic bronchitis
Special risk factor	Body mass index, analyzed in classes, significantly related with AD and showing a parabolic relationship with lower AD at extremes of the curve
Notes and Comments	Large differences of AD across cohorts ranging from 72.4 years in East Finland to 77.9 in Crete (Greece)
PAPER 4	
Paper	Aging Clin Exp Res [47] Determinants of AD in multiple cohorts and countries during 60 years
Populations	10 cohorts from 6 countries (USA, Finland, the Netherlands, Italy, Greece, Japan) with 9043 men aged 40-59 years
End-point and follow-up	AD in all-cause mortality with a follow-up of 60 years and 0.8% survivors (practically extinct cohorts)
Tested determinants	12 major mainly cardiovascular diseases (CVD) risk factors, including lifestyle behaviors, classical risk factors, prevalence of CVD and silent ECG abnormalities
Models	Multiple linear regression with individual AD as end-point (dependent variable) and 12 possible determinants as independent variables adjusted for dummy variables identifying the 6 countries
Variables directly and significantly related with AD with $p < 0.05$	Age, vigorous physical activity (versus sedentary habits), ex-smokers and never-smokers (versus smokers).
Variables inversely and significantly related with AD with $p < 0.05$	Systolic blood pressure, heart rate, serum cholesterol, prevalence of major cardiovascular diseases, silent ECG abnormalities
Special risk factor	Body mass index significant if handled in a quadratic shape (parabolic) with low AD at both extremes of the curve
Variation across cohorts	Mean AD ranging from 71.8 in East Finland to 80.5 in Crete (Greece)
Notes and comments	An example of AD measured after 60 years of follow-up

Table 4. Example of AD in cohorts of elderly men of the SCS.

PAPER 5	
Paper	Aging Clin Exp Res [45] AD in elderly European cohorts
Populations	2457 elderly men aged 65-84 years, survivors in 4 countries (Finland, the Netherlands, Italy, Serbia) after 25 years of follow-up.
End-point and follow-up	AD after the subsequent 25 years of follow-up with 7% of survivors (almost extinct cohorts). Levels of AD ranging 80.6 in Finland to 83.3 in Italy
Tested determinants	18 risk factors, including major prevalent diseases and dummy variables identifying countries
Models	Multiple linear regression with AD as dependent variable and the above determinants as predictors
Variables directly and significantly related with AD with $p < 0.05$	Age, never-smokers (versus current smokers), HDL cholesterol
Variables inversely and significantly related with AD with $p < 0.05$	Smokers (versus never-smokers), heart rate, major ECG abnormalities, Coronary Heart Disease, Heart Diseases of Uncertain Etiology, Stroke, Chronic bronchitis, Cancer
Special risk factor	Body mass index significant if handled in a quadratic shape (parabolic) with low AD at the extremes of the curve
Comorbidity index	Created on the basis of major prevalent diseases and defined by the number of conditions for each individual (from 0 to 4). At baseline 69.5% of men had at least one major prevalent disease
Model 2	Multiple linear regression with AD as end-point (dependent variable), individual comorbidity index as independent variables plus other risk factors as confounding variables
Findings	A clear decreasing gradient of AD as a function of comorbidity index with a loss of AD from 1.87 to 6.39 years across the extreme levels
Notes and Comments	Findings focus on co-morbidity index in the elderly

Table 5. Example of AD for fatal cardiovascular diseases in cohorts of the SCS.

PAPER 6	
Paper	Acta Cardiol [40] AD in fatal Cardiovascular Diseases (CVD)
Populations	10628 men aged 40-59 years in a 45-year follow-up of 13 cohorts of 7 countries (USA, Finland, the Netherlands, Italy, Serbia, Greece, Japan)
End-point and follow-up	Major fatal CVD: Coronary Heart Disease (CHD), Heart Diseases of Uncertain Etiology (HDUE), Stroke (STR) during 45 years with 7% of survivors (quasi extinct cohorts)
Average AD findings	In the pool of all cohorts: AD for CHD=73.5; HDUE=70.1; STR=75.3. Differences across all possible comparisons highly significant
Notes and Comments	In the single countries, findings coherent with the above picture.

Table 6. Example of AD in ecological analysis of cohorts of the SCS.

PAPER 7	
Paper	Eur J Prev Cardiol [44] Ecological analysis
Populations	12763 men aged 40-59 in 16 cohorts of the Seven Countries Study, from 7 countries (USA, Finland, the Netherlands, Italy, Croatia (former Yugoslavia), Serbia (former Yugoslavia), Greece, Japan)
End-point and follow-up	Mean AD in each cohort during a follow-up of 50 years with 3% survivors (quasi extinct cohorts)
Possible determinants	Mean dietary Inflammation Index of 16 cohorts computed from 19 food groups and several nutrients
Model	Linear correlation coefficient
Findings	$R=0.51$ with $p=0.044$
Notes and Comments	A significant association of Dietary Inflammation Index with AD

4. Discussion

OLS regression relies on the assumption of normally distributed residuals for valid inference and confidence intervals. However, age at death in adult cohorts is typically left-skewed. In the early phases of our work in this area, multiple linear regression was the primary choice, and alternative modeling approaches (such as generalized linear models) were not formally evaluated. Simply, some unpublished tests using the natural log of age at death did not yield results that differed substantively from those using the basic format for age at death. Furthermore, in our long-term (many decades) experience in this field, we have never found a single biological or medical variable that could be classified as strictly "normally distributed," and real, robust alternatives for

these extinct cohort scenarios are limited. Actually, in Paper 1 (reference [46]) presented in Table 1, we added a Cox proportional hazards model using the same covariates and all-cause mortality (instead of age at death) and reached rather similar findings.

Regarding the regression models, the independent variables include baseline age (40–59 years) as a predictor for Age at Death (AD). Since individuals must survive to the baseline age to be included in the cohort, a structural selection effect (left truncation) is present where baseline age sets a hard lower bound on the age at death. This is an inevitable limitation in longitudinal studies of this nature, as measuring risk factors in newborns and following them until the end of their lifespan is practically unfeasible. To address and adjust for this, baseline age (at entry) was systematically

added as a covariate in the models to adjust the estimates for the baseline spread of age at the time of the entry examination, thereby accounting for potential age-at-entry effects.

Beyond the abovementioned technical notes, it is worth adding some details that were too cumbersome to be included in the tables of results. In particular, the comorbidity index mentioned in Table 4 (Paper 5) was defined by the number of baseline conditions for each individual (ranging from 0 to 4). It was constructed using 7 major prevalent diseases: coronary heart disease, heart diseases of uncertain etiology, peripheral artery disease, stroke, diabetes, chronic bronchitis and allied conditions, and cancer. While there were 7 candidate conditions, no individual carried more than 4 of them simultaneously. Each condition was weighted equally (assigned a score of 1 if present, and 0 if absent) and added up to form the final index.

Moreover, the last example (Table 6, Paper 7) deals with an ecological analysis of 16 cohorts, and therefore the interpretation of these findings requires caution. While the Dietary Inflammation Index was significantly associated with cohort-mean age at death at the cohort level, there is a risk of the ecological fallacy. A correlation observed at the cohort level does not necessarily imply that individuals with higher dietary inflammation die younger within those cohorts, and individual-level associations may differ from cohort-level patterns. Readers should thus be cautioned against drawing direct individual-level inferences from these aggregate ecological correlations.

5. Conclusions

This review confirms that AD is a useful metric to be applied in field-epidemiology data. It is mandatory that the study population-cohorts have reached the extinction or nearly extinction which represents an exception for most studies. On the other hands, AD represents a kind of summary dealing with the individual history of health and disease. Moreover, it is associated in direct or inverse way, with a large number of personal characteristics-risk factors including some of those which tested on single fatal or not-fatal morbid condition. This fact is likely bound to the large numbers and to the fact that AD represents, at the best, the pool of all possible morbid conditions.

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Difficulty in Diagnosing Schizoaffective Disorder and Bipolar Disorder based on a Clinical Case

Article Record

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Abstract

Since Schizoaffective Disorder and Bipolar Disorder share some overlapping symptoms, when a patient presents with symptoms similar to both Schizoaffective Disorder and Bipolar Disorder, it becomes necessary to provide continuous and careful care while simultaneously reviewing all knowledge about both disorders. The objective of this work is to address the pre-diagnosis phase, the moment of diagnosis, and the post-diagnosis phase of a patient initially diagnosed with Schizoaffective Disorder who, after years of various treatments until finding the most appropriate one, was diagnosed with Bipolar Disorder Type I. The methodology used for this work was bibliographic research in databases such as SciELO, PubMed, Google Scholar, etc., using the descriptors: schizoaffective disorder, bipolar disorder, childhood mental health, and psychoactive drugs. This entire process lasted approximately six months, during which around 20 publications addressing the chosen descriptors were analyzed, resulting in the selection of 14 articles or scientific papers. The results of this analysis demonstrated that the process of observing symptoms to arrive at a diagnosis and then the treatment process does not reside solely in the current aspects presented by the patient during initial consultations, but also in the patient's past history. This is because there are often previous problems that can affect the diagnosis and the treatment process, which is frequently observed in cases of overlapping symptoms, for example.

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Difficulty in Diagnosing Schizoaffective Disorder and Bipolar Disorder based on a Clinical Case

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Abstract

Since Schizoaffective Disorder and Bipolar Disorder share some overlapping symptoms, when a patient presents with symptoms similar to both Schizoaffective Disorder and Bipolar Disorder, it becomes necessary to provide continuous and careful care while simultaneously reviewing all knowledge about both disorders. The objective of this work is to address the pre-diagnosis phase, the moment of diagnosis, and the post-diagnosis phase of a patient initially diagnosed with Schizoaffective Disorder who, after years of various treatments until finding the most appropriate one, was diagnosed with Bipolar Disorder Type I. The methodology used for this work was bibliographic research in databases such as SciELO, PubMed, Google Scholar, etc., using the descriptors: schizoaffective disorder, bipolar disorder, childhood mental health, and psychoactive drugs. This entire process lasted approximately six months, during which around 20 publications addressing the chosen descriptors were analyzed, resulting in the selection of 14 articles or scientific papers. The results of this analysis demonstrated that the process of observing symptoms to arrive at a diagnosis and then the treatment process does not reside solely in the current aspects presented by the patient during initial consultations, but also in the patient's past history. This is because there are often previous problems that can affect the diagnosis and the treatment process, which is frequently observed in cases of overlapping symptoms, for example.

Keywords: *Schizoaffective Disorder, Bipolar Disorder, Mental Health*

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1. Introduction

The development of this article occurred in parallel with another one written by the same author, which addressed Schizoaffective Disorder (SZA) and Bipolar Affective Disorder (BAD) within clinical practice. However, unlike the other, this one delves deeper into the clinical care itself and the essential moments that led to the revision of a diagnosis and the finding of a more effective treatment for the patient.

This construct provides an approach related to Clinical Psychology and Psychotherapy, because as a psychologist, care must be provided in accordance with the precepts of Psychology. However, the treatment of a patient with mental disorders involves joint monitoring with other professionals, such as a psychiatrist, thus making it feasible to update the diagnosis. It is important to clarify this information due to the ethical and professional responsibility that must be respected during care.

One of the main points this article seeks to address is how the process of illness and the emergence of a mental disorder involves a timeline of the patient's entire life, where situations that occurred in the past may have served as triggers for both previous severe crises and more recent ones. Important aspects of childhood and adolescence, such as family relationships, can severely impact both an individual's mental health and the treatment process, because the family can often be considered a support network, even though it is not necessarily a positive and healthy element in the patient's life.

Bearing in mind that these main points are related to diagnosis and the treatment process, this article will discuss a clinical case that exemplifies the importance of life history and the stages prior to the start of treatment, and the difficulties that arise during treatment when there are overlapping symptoms, characteristics that do not fully correspond to what is stated in the main diagnostic manuals used, and the need for collaborative work between the patient and the psychiatrist treating them.

Other topics that will be addressed include drug use during adolescence and how mental health is related to it, the worsening of symptoms of a mental disorder leading up to the first episode, overlapping symptoms between mental disorders (in the case of this article, between Schizoaffective Disorder and Bipolar Disorder), the treatment process in the face of this overlap until it is clarified, updating a diagnosis, pharmacological treatment in SZA and Bipolar Disorder, the context of comorbidities, and finally, the importance of ethical and careful care from the professionals involved in the treatment.

2. Mental Health in Childhood

One of the most essential periods in an individual's life is their childhood, as this is when the main cognitive and psychological developmental processes - as well as psychic structuring - occur. If these stages do not occur healthily, a mental disorder with significant symptoms such as Schizoaffective Disorder (SZA) or Bipolar Disorder (BAD) may appear in the future.

The care of the patient in the clinical case presented in this article allowed us to observe both the present period (from the beginning of treatment to the present day) and their past, from childhood to the most critical period of their clinical condition. Having a broad perspective on the patient's life allowed us to understand how genetic heritability and environment contributed to the development of their symptoms.

The relationship between their biological parents was always extremely troubled, with a history of psychological and physical aggression, to the point that they separated some time after the patient's birth. In addition to a history of abuse, his mother had a diagnosis of major depression (though possibly bipolar affective disorder, due to psychotic episodes and characteristic manic periods), and His father has alcoholism with a long history of aggressive and self-destructive behavior, having had little effective work experience as a police officer, spending much of his time away from work.

The patient had contact with his father, but lived most of his life with his mother and stepfather. However, in both his father's and mother's homes, he experienced an aggressive and cold environment, where he never felt like a son—so much so that neither of them ever called him "son". During childhood, when he began to have difficulties coping with that environment and performing his daily activities, he began to be psychologically abused by his mother, without receiving any positive support regarding what he was experiencing.

Aligning the clinical case with the field of childhood mental health, regardless of family structure (in terms of who is part of it), it is through this nucleus that the child's development will occur until adulthood. The family ends up having an important role "in promoting mental health and caring for its members in every sense, as it is the first group that will interact with the child, from birth" (Bertolote, 2020); Therefore, if the family unit fails to provide this for the child, their ability to perceive, interpret, and manage daily challenges will be impaired. This can cause a series of traumas and difficulties, potentially leading to future psychological disorders or issues.

The family nucleus is "the first social space of an individual; even before attending school, the child, through the family, comes into contact with other people who make up their growth environment" (Rocha, 2020); This interaction allows the child to learn to communicate, listen, and interact with people, thus building a bond with them. Therefore, if the environment is affectionate, it will have a positive impact on intellectual and emotional development into adulthood, if this is not offered, the effect will be the opposite.

Recognizing this family dysfunction is not intended to blame the family for these situations, but rather to help the family become aware of it and work individually or together to mitigate the damage (Bertolote, 2020). Psychotherapy serves as an important tool at this time, working not only with the patient but also with the family.

Since the family continues to play an important role in the field of mental health by promoting protective factors and reducing the risks of mental illness, activities and tools focused on health in childhood and adolescence should address not only the patient but also family members. This point relates to child and adolescent clinical practice, but may also be relevant in adult clinical care. (Rocha, 2020)

For adults, the family's function is no longer "one of identity formation, but rather of supporting experiences throughout life, whether the individual copes well or not with suffering" (Rocha,

2020). If an adult can find a point of support in their family, they will have good results when facing difficulties, because, as mentioned earlier, even as an adult, their mental health can be impacted by family ties, and regardless of whether they leave and build a new family, this impact will continue if left untreated. (Rocha, 2020)

In addition to psychotherapy, family life education programs, support groups, counseling, etc., emerge as means to change family instability. Another fundamental point in anyone's life is school, which is a different environment from the family, but which can also interfere. It is a place where the individual may be able to compensate for the wear and tear and suffering they may experience due to their family. (Asevedo, 2020).

A pertinent point for mental health professionals, when analyzing a patient's childhood period and in the care of a child (if there was previous care and now they are an adult), is the care we need to take not to view the developmental process as something standardized and rigid, which can sometimes happen because of the way we learn in undergraduate studies. Each relationship is unique, possessing a singularity in facing life's circumstances, and this will be reflected in clinical observations, where there are moments when something unexpected can occur in an individual's life, at a time that theoretically wouldn't be so serious for other people, but which can be severe enough to make someone ill (Fernandes, 2019).

There are situations, such as the case of the patient mentioned in the article, where the individual is exposed for a long time to a harmful environment for various reasons and factors, and the issues that were difficult to deal with in childhood end up persisting into adulthood and continue to fuel the worsening of the patient's symptoms. The persistence of these difficulties breaks the conception that the developmental process has specific phases which, upon completion, require the abandonment of what happened during that stage. For this reason, it is important to examine the patient's entire life history in detail and not allow clinical practice to be limited by certain methodological conceptions, while also understanding the importance that childhood can have in the context of mental health.

3. First-Psychotic-Break-and-use-of-Psychoactive-Drugs

Before the onset of more severe symptoms and the first episode, the patient had been exhibiting a series of characteristics demonstrating vulnerability in regulating and managing their emotions, as well as difficulties with attention and learning since late childhood. This could be indicative of symptoms related to a possible primary mental disorder, namely Attention Deficit Hyperactivity Disorder (ADHD). Because they lived in a chaotic and neglectful family environment, these symptoms were never recognized by family members, and the few times treatment was attempted, it was not effective or complete, ultimately leaving the patient even more vulnerable mentally and emotionally.

During adolescence, he ended up building friendships with people who had destructive or self-destructive behaviors, which corresponded to what he was also feeling, as he lived a mix of being a victim of school violence and feeling the need for friendship groups to "distract" himself. It was through these friendship groups and family customs that he ended up experimenting with alcohol and, after a while, some types of illicit drugs, which did not seem wrong to him, due to the vulnerability he had been harboring for a long time.

Regarding drug use, in a general context, people use them not only "to numb pain, but also as an instrument of pleasure" (Lima & Surjus, 2019). For adolescents, early drug experiences serve both as an attempt to construct a social identity and feel a sense of belonging to a particular group, as well as functioning as a remedy that alleviates and numbs their own anxieties and emotions, which they often don't know how to handle. This process makes it difficult to recognize psychological suffering and the worsening of symptoms before adulthood (Lima & Surjus, 2019).

In cases where reality is so violent and cruel to the mind, drugs begin to play a dual role: providing excitement and a possible new reality, which is illusory and anesthetizing, where the individual no longer cares about danger or contact with death. Furthermore, the drug fills the void, the holes within the psyche, providing pleasure that is not felt when in contact with reality, and this experience ends up being imprinted on the subjectivity, reinforcing substance use (Lima & Surjus, 2019).

Recognizing the suffering behind drug use in adolescence can offer not only avenues to ensure young people receive dignified treatment, but also allows for working with the manifestation of emotions such as anger, which tends to be one of the central feelings in adolescence. When an individual is in an environment that offers care and recognition, they learn to manage this anger, but by not having this, they stop using anger as a driving force to motivate and achieve positive goals, and instead uses it to instigate violent acts against himself and others. (Lima & Surjus, 2019).

Despite having experimented with alcohol and drugs, the patient claimed that he used them only a few times before his first psychotic episode. However, early in adulthood, around the age of 19, the use of a specific drug coincided with a catalyzing situation that was strong enough to further expose his mental and emotional vulnerability, to the point where he was unable to cope, triggering his first psychotic episode.

The situation involved a work problem. He had previously worked in a very welcoming environment where he finally felt recognised; things functioning adequately, and he was able to perform all his duties. However, there was a sudden change of workplace, coupled with a lack of communication within the company about this change. His ongoing tasks were left unfinished, preventing him from completing them and that created a significant problem, and the blame fell on him, ultimately destabilizing him completely.

The patient's first episode included symptoms such as delusions of persecution, auditory hallucinations, panic attacks, and avoidance behaviors. It was a very unclear and turbulent period for the patient, who took a long time to remember what happened during that time in his life. Medication and hospitalization provided some relief from the symptoms, but the condition persisted for a long time. After the episode, for three years, the patient used alcohol and cocaine as a way to try to hide and alleviate some symptoms, to the point where he could socialize with other people. It was the choice of cocaine, specifically, that made the situation even more serious.

The use, and especially the abuse of drugs, puts the health of the user at risk, in addition to leaving them exposed and vulnerable to the effects of the drug and the possible consequences of its consumption. The context of drug use is so serious that it transcends an individual problem and becomes a public health issue. In the context of illicit drugs, there are psychoactive substances that act directly on the CNS (Central Nervous System), causing a high degree of abuse and dependence (Ferreira, *et al.*,

2017). In the patient's case, the illicit drug of choice was cocaine, which is psychoactive.

Cocaine has a high dopaminergic effect, causing a high rate of dependence. When an individual uses it for a long time, they may develop serious psychiatric symptoms such as anxiety, mania, depression, panic, personality disorders, etc. (Ferreira *et al.*, p. 361, 2017). Other damages caused by cocaine use include impaired cognitive function, chronic exhaustion, and alterations in frontal lobe function (Ferreira *et al.*, 2017).

Since the patient used drugs combined with alcohol after the episode, for a period, it ceased to be sporadic use and became chronic, possibly leading to neuroadaptations due to neurochemical changes resulting from cocaine and alcohol use, which subsequently manifested as problems with memory and perception, for example. These neuroadaptations occur to maintain brain homeostasis while the drug is present in the body; without it, or with reduced use, an imbalance occurs, leading to withdrawal syndrome (Ferreira *et al.*, 2017).

In particular, cocaine acts directly on dopamine, norepinephrine, and serotonin, with dopamine being the most affected. With this alteration, the individual tends to "feel excessively self-confident, powerful, irresistible, and capable of solving any challenge" (Ferreira *et al.*, p. 365, 2017). However, this only happens in the initial stages of use; after a while, the individual uses the drug solely for the reward it provides. At this point, the individual has already disconnected from social, family, emotional, learning, and professional interests to experience the potential gains offered by the drug (Ferreira *et al.*, 2017).

Neurochemical alterations and occasional changes due to drug use can be stable and long-lasting, where even after a considerable period without use, the individual may still experience withdrawal symptoms and risk relapse. Furthermore, there are significant damages depending on the duration of use and the amount of drug consumed, such as memory loss, loss of analytical ability, among others (Ferreira *et al.*, 2017).

Another important topic to address for clarification is the concept of addiction and chemical dependency, considering the patient's history of drug use. Addiction would be a behavioral condition in which "there is a craving for the drug, where its consumption can end up controlling behavior and motivation for use" (Ferreira *et al.*, 2017). Chemical dependency, on the other hand, is a situation where both the mind and body have become accustomed to the frequent use of the drug, leaving the individual in a state where they need the drug to survive without experiencing withdrawal symptoms. Since the use of the substance ended years before the patient began the current therapeutic process, most of the lingering effects of withdrawal syndrome had disappeared, leaving only the symptoms related to Bipolar Affective Disorder and comorbidities.

4. Overlapping-Symptoms-between-Schizoaffective-Disorder-and-Bipolar-Disorder

This topic regarding the overlap of symptoms between Schizoaffective Disorder (SZA) and Bipolar Disorder (BAD) was chosen because it accurately reflects what happened in the clinical case. For many years, the patient had a diagnosis of Schizoaffective Disorder, postulated during one of his hospitalizations and subsequently maintained by all the psychiatrists who treated him. However, there is a complicating factor in this matter, because hospitalizations occurred and the patient did not stay with the same professional for many months. Because of this, the diagnosis

was maintained without an in-depth analysis of the symptoms, and thus the condition remained the same. Only later, when he began to be treated by the same psychiatrist for more than 2 years, did this hypothesis begin to be analyzed.

This factor of misdiagnosis or failure to update it occurs in specific contexts, which are not so common in a clinical setting, but can arise in other settings, such as psychiatric referral centers, for example. These are cases of homeless individuals who lack identification or sufficient information, as well as patients who end up being hospitalized due to an acute psychotic crisis or suicide attempt. In these situations, multiple hospitalizations may occur, and patients may be seen by various professionals, which can lead to incorrect diagnoses, differing from one another, directly affecting symptom remission and proper treatment. (Costa *et al*, 2024).

The overlap of symptoms is a very important issue, and we need to be constantly aware of it because it can happen, especially with disorders that have very similar symptoms. This makes it very difficult to distinguish the patient's specific disorder, whether it is a single disorder or if there are other comorbidities. This situation occurs frequently between mood disorders and psychotic disorders, such as schizoaffective disorder, for example. (Assunção, 2024).

Regarding Schizoaffective Disorder (SZA), diagnosis is extremely necessary and must be carried out with great care, as small details will differentiate it from schizophrenia or Bipolar Affective Disorder. According to the DSM-5-TR, the symptoms of schizoaffective disorder are: A prolonged and uninterrupted period of episodes of altered mood (manic or depressive), which occur simultaneously with two or more symptoms of diagnostic criterion A of schizophrenia, which include delusions, hallucinations, disorganized speech, catatonic or disorganized behavior, and negative symptoms. SZA is divided into 3 subtypes: manic, depressive, and mixed. (APA, 2023). The main detail to distinguish the symptoms of SZA and BAD within these criteria is that delusions and hallucinations must persist for 2 weeks or more during the absence of a mood episode (manic or depressive) and must remain so for the entire duration of the disorder until the time of diagnosis.

For many years, SZA was treated superficially, without major changes regarding the way it was performed, the methods or tools for diagnosis, and its treatment. This is noticeable both in the little or almost no change in recent manuals, as well as in the few research studies and articles that address both the disorder and the overlap of symptoms with Bipolar Affective Disorder. (Abrams *et al*, 2008)

This superficial treatment can be explained in part by the uncertainty caused by the manifestation of SZA symptoms, which ultimately prevents a consensus on the conceptual and clinical characteristics of the disorder. Some of the doubts would be the following: Could SZA be a reflection of the simultaneous occurrence of two diseases (schizophrenia and bipolar disorder) and therefore not need a category (single subcategory) in the main diagnostic manuals; could it be a variant of schizophrenia, where the symptoms of mood alteration would be more expressive than usual in schizophrenia, but not so discrepant; and could SZA be a more acute form of major depressive or bipolar disorders, where there would be remnants of psychotic symptoms between episodes of mood alteration? And unfortunately, it is these doubts that discredit the characteristics of SZA. (Abrams *et al*, 2008).

These questions stem from a limitation of the categorical approach, as well as many mental health manuals and professional practices, which require that clinical and symptomatic conditions

of a disorder be organized into distinct categories. Disorders like SZA, which has a complex symptomatic manifestation, can complicate the organization and categorization of symptoms, as clinical observations often indicate that not all symptoms fit neatly into established categories. Therefore, the shift towards a more dimensional approach has been very welcome in recent years (Abrams *et al*, 2008).

An important point that helps to understand why difficulties with overlapping symptoms still occur is the diagnostic criteria of the main diagnostic manual used by psychiatrists, the DSM. The first criteria established as we know them today were in the DSM III R, but since that edition, there have been no consistent changes that would provide clearer information about the symptoms and pathological manifestations that would be observed and that would be part of SZA, as this would prevent the easy overlap of symptoms between SZA, Bipolar Disorder, and Schizophrenia. (Abrams *et al*, 2008).

Even though the only recognized set of SZA symptom criteria is that of the DSM, some authors address clinical symptoms that help differentiate between SZA and Bipolar Disorder (BAD). According to Abrams *et al*. (2008), "delusions at the first consultation are more frequent among people with Bipolar Disorder, while hallucinations are more common among people with schizophrenia than among those with SZA or Bipolar Disorder." Another observation is that, subtly, patients with SZA present a lower intensity of mood alteration and are less playful than patients with manic episodes in Bipolar Disorder. (Abrams *et al*, 2008).

There are certain characteristics and symptoms, in addition to those mentioned in the previous paragraph, that, depending on how they appear in the initial consultations, can ultimately influence the diagnosis, and every professional needs to be attentive to these aspects. If the first episode observed by the professional is depressive, there is a high probability that the final diagnosis will be bipolar disorder (BAD), while if the first episode is manic, the greater chances may end up being a diagnosis of Schizoaffective Disorder (SZA) or Bipolar Disorder. This point demonstrates that, when assessed at the beginning of psychological treatment, the clinical characteristics and pathological manifestations will guide the diagnostic hypothesis for the formation of a future diagnosis. (Abrams *et al*, 2008).

In the last decade, new methods with imaging exams and other types of exams are being researched to improve the collection of information for diagnosis. However, since most studies are individual, there is still no clear consensus on the feasibility of analyzing neuroendocrine, neurochemical, neurobiological, and genetic functions through these tests. If there were, it would allow for the verification of alterations in these areas in relation to each mental disorder. Even without a clear and standardized resolution for the use of these tests, they are a good option in cases of overlapping symptoms, such as those that occur between Bipolar Disorder and Schizoaffective Disorder, as they would help to distinguish and separate the alterations to arrive at the correct diagnosis.

After discussing SZA in depth, it is also important to briefly discuss the symptoms of Bipolar Affective Disorder and, especially, the psychotic symptoms that occur when a manic, mixed, or depressive episode has reached an acute and very serious stage. Bipolar disorder (BAD) is divided into subcategories, the first being Type I Bipolar disorder, which has the following symptoms: elevated mood, including euphoria, feelings of grandeur, hyperactivity, increased sexual activity, decreased need for sleep, risky behaviors, irritability, and aggressiveness, among others; all corresponding

to manic episodes. However, there are also depressive episodes, which have symptoms such as anhedonia, sadness, vegetative symptoms, and psychomotor changes. In addition to these reported episodes, there is also the mixed episode, where mania and depression occur simultaneously. (Scaini *et al*, 2020).

The second subtype would be Bipolar Disorder Type II, which includes episodes of hypomania and depression, the latter being predominant within this specific type. Hypomania has diagnostic criteria similar to a manic episode, but the intensity of the symptoms is somewhat milder, not causing substantial and abrupt impairments in the patient's life like mania, for example. However, it still tends to leave the patient confused, due to the particular characteristics of this subtype, where even with hypomania, their thoughts may remain negative along with increased energy, which can contribute to suicide attempts and substance use. (Soares *et al*, 2024)

The other subtypes of Bipolar Affective Disorder are Cyclothymic Disorder (Cyclothymia), Substance- or Medication-Induced Bipolar and Related Disorder, Bipolar and Related Disorder Due to Another Medical Condition (which may be caused by a disease or disorder that causes similar symptoms), and Other Specified or Unspecified Bipolar and Related Disorder. (APA, 2023). Regarding substance-induced Bipolar Disorder, to differentiate it from primary Bipolar Disorder (unrelated to medication/substance), it is important to understand that to receive this diagnosis, it is necessary to analyze whether the patient has persistent symptoms long after the substance is no longer being used. (Soares *et al*, 2024).

Within Bipolar Disorder, psychotic symptoms are a fundamental topic because they involve the context of overlaps, as they can occur in both Bipolar Disorder and Schizoaffective Disorder. There are cases in which they appear sporadically throughout an individual's life (as happened with the patient mentioned in this article), and there are others in which they occur very frequently, being more recent symptoms. Generally, delusions are much more common in Bipolar Disorder than hallucinations, but both can occur and appear much more frequently in manic or mixed Type I episodes than in Type II. Psychotic symptoms are not as severe as those of schizophrenia at its core, however, the damage to the patient's life can be extensive due to the combination of these symptoms with the mood swing episode. (Chakrabarti & Singh, 2022)

The frequency of psychotic symptoms in bipolar disorder is equivalent to that of schizophrenia, and there are no significant qualitative distinctions in the delusions and hallucinations of the two. Furthermore, due to this high occurrence, especially in manic states, it may be impossible to distinguish between bipolar disorder and primary psychotic disorders during the acute phase of symptoms. The main delusions that appear are grandiosity, persecution, and reference, while the hallucinations would be auditory, verbal, and visual (Chakrabarti & Singh, 2022). Psychotic symptoms can be mood-congruent or incongruent (of the episode) and can also be first-order, including: thought broadcasting, hallucinatory voices that converse, voices that comment on the action, experience of bodily influence, thought theft or insertion, thought broadcasting, delusional perception, and experiences of passivity (Malinoswki *et al*., 2020).

With these descriptions of psychotic symptoms, it is possible to understand why the timing of their occurrence is crucial for symptom overlap, since the presence of delusions and hallucinations can lead to the false impression that the patient may have a psychotic disorder while they are experiencing a psychotic episode. Often, in emergency situations where rapid drug therapy is necessary,

misdiagnoses can occur, negatively impacting the individual's life due to inadequate treatment (Chakrabarti & Singh, 2022).

The next section will address the treatment process and diagnostic update of the clinical case presented in this article. This involved a meticulous psychodiagnostic process over several months, with monitoring of the treatment and symptomatic picture, until issues involving misdiagnosis, ineffective treatment, and the negative consequences generated over several years of the patient's life were analyzed.

5. Treatment-Period-and-Diagnostic-Update

When the patient sought to begin therapy again (he had previously done so with another professional), he had already been receiving psychiatric care for several years, but felt that the treatment was not entirely effective and that many symptoms were still directly affecting his daily life. The main symptoms he reported were: mood swings, sleep paralysis, excessive sleep (he slept about 12 to 14 hours a day, and in other situations, much more), panic and feelings of escape, racing and negative thoughts, muscle stiffness upon waking, to the point of experiencing pain in the wrist, arm, and leg joints, anhedonia, lack of self-care and hygiene.

In the first months of treatment, the patient was still living with his mother and was unable to return to the labor market, spending almost all his time at home. In his attempts to get an interview and find a job, he would manage to go to the first day, but would begin to experience symptoms of panic, feelings of escape, altered sensory perception, racing thoughts, eventually leading to delusions of persecution. During the night, while sleeping, he had a series of nightmares until he felt he was experiencing sleep paralysis. Most of these nightmares involved dying or killing someone (usually his parents). At this time, the patient was already taking an antipsychotic, a mood stabilizer, and an antidepressant. Therefore, in parallel with the clinical appointments, which are part of the diagnostic process, the use of the medications and their effects were also being monitored. This procedure became essential for correcting the treatment.

During these initial appointments, the psychodiagnostic process took place, which is a very important step and needs to be carried out in a detailed and careful manner. It involves the analysis of the symptoms presented by the patient, together with what is being observed by the psychologist, and physical and neurological examinations, to verify alterations in both cognitive function and brain structures, as this will make it possible to rule out other medical conditions that may be causing the symptoms. It is also interesting to apply assessment scales "to measure the severity of symptoms, the damage caused by them, and then to verify possible changes influenced by the therapeutic intervention" (Assunção *et al*, p. 1458, 2024). However, the application of scales is not mandatory, because these changes can be monitored through observation during clinical sessions.

Regarding treatment, this is carried out through a combination of medications, psychological and psychiatric care, as well as modifications to the patient's daily life and activities. Therefore, what differentiates the treatment of someone with schizoaffective disorder is the use of antipsychotics, mood stabilizers, and antidepressants. In contrast, in bipolar disorder, depending on the type, the use of antidepressants can worsen symptoms. This is why the issue of overlapping symptoms is important, because if it is not done carefully, a medication may end up being prescribed that will not bring improvements to the patient. (Assunção, *et al*, 2024)

Within the treatment, it is pertinent that professionals attending a patient with bipolar disorder or schizoaffective disorder carry out clinical observation throughout the treatment period, but without focusing solely on monitoring symptoms, because this can impair the perception of disease progression and improvement, as well as make it difficult to readjust the treatment plan and perceive possible manifestations of crises, which can occur even with medication use. (Assunção, *et al*, 2024)

With this in mind, the sessions continued for a few more months, during which many symptoms were observed. At times they coincided with the previous diagnosis (SZA), but at other times they did not match, which began to raise some questions. Gradually, it became possible to understand that there was some problem hindering the effectiveness of the medications being used, mainly because the patient seemed to oscillate between episodes of mania and depression, even having mixed episodes, to the point of presenting first-order symptoms, in addition to some visual hallucinations.

After the initial symptoms subsided, the diagnosis of Schizoaffective Disorder remained in mind due to the visual hallucinations that can also occur in this disorder. However, after this acute episode of psychotic symptoms, no further symptoms at this level emerged, allowing the previous questions to be investigated in parallel with the therapy sessions. Gradually, it became clearer when the patient was experiencing a manic episode, a depressive episode, a mixed episode, and when he was euthymic. Simultaneously, some medication changes occurred. The patient first stopped using the mood stabilizer he had used for a long time (valproate) and switched to lithium, then discontinued the antidepressant, maintained the antipsychotic he had been taking for many years (quetiapine), and began using bupropion.

With this change, most of the symptoms decreased in intensity, and he began to be able to work more stably, without experiencing the more severe symptoms that had occurred previously, which raised a warning sign. Due to some health problems he began experiencing with lithium use, mainly gastrointestinal issues and severe tremors, he switched from lithium to valproate and from quetiapine to aripiprazole, due to the intense sedation he felt with quetiapine, which caused him significant lethargy throughout the day. During this readjustment, the patient experienced a manic episode, which allowed for a clearer observation of all the symptoms that appeared during this episode, since he never again experienced the psychotic episodes together. From this observation, made over several weeks, in conjunction with the treatment that had already been ongoing for at least two years, it became clearer that the symptoms corresponded to Bipolar Disorder Type I.

Bipolar Disorder (BAD) is a mental illness that becomes a chronic disorder over the course of its manifestations, characterized by mood swings, with Types I and II being the main subtypes. Due to mood swings, functional and relational impairment can occur in multiple areas of the patient's life, mainly because they may have difficulty recognizing the severity of the symptoms, which is more noticeable to those who live with the individual. (Scaini *et al*, 2020). This condition tends to worsen when psychotic symptoms are present, because due to its dispersion, it tends to further aggravate the course, prognosis, and response to treatment of the patient. (Chakrabarti & Singh, 2022).

Currently, there are pharmacological and non-pharmacological treatments that can be used, some of which are quite effective in many patients. However, some patients may remain symptomatic even with treatment. Therefore, there is a focus on advancing the understanding of the neurobiology of bipolar disorder in order to

identify new therapeutic targets, as well as biomarkers for possible early detection, prognosis, and treatment response (Scaini *et al.*, 2020).

This advancement is important because the biochemical brain changes in patients with bipolar disorder are quite complex, and exposure to a chaotic environment conducive to this can lead to the development of the first episode, as well as subsequent worsening and chronicity. Therefore, information such as “genetic, epigenetic, molecular, physiological, clinical, environmental, and neuroimaging factors” (Scaini *et al.*, p. 536, 2020) can greatly assist in improving both diagnosis and treatment, and in overcoming a negative prognosis, as well as serving as a complement to all these stages, which are currently essentially clinical (Scaini *et al.*, 2020).

In the last decade, numerous studies have explored the clinical application of neuroimaging exams, at least as a complementary tool for treatment; however, a resolution enabling the more comprehensive use of these exams has not yet been established (Scaini *et al.*, 2020). While it may seem different from the other topics discussed in this article, this issue of exams is important to address because it presents a challenge at various points in treatment, not just at the beginning. There are times when the diagnosis needs to be re-evaluated, and these exams would be a key element. In addition to being a complication for clinical and pharmacological treatment, there is no biomarker with consistent scientific validation for a more effective intervention in bipolar disorder.

Another complicating factor in the diagnostic process of Bipolar Disorder is that the disorder has a symptoms chart with certain patterns, but also characteristics and manifestations that differ among all sufferers. In addition to various comorbidities and cognitive impairment depending on the case, many genetic and environmental factors need to be analyzed. This entire process—covering anamnesis, interviews, session monitoring, and psychiatrist-ordered exams—takes place within a clinical setting, which requires that treatment and care are delivered correctly, continuously, and without interruption. (Scaini *et al*, 2020).

6. After-Diagnostic-Update

It's not just the complexity of the clinical picture that makes Bipolar Disorder more difficult to understand, but also the influence that environmental exposure can have, not only before the onset of the first crisis, but also after the episodes. The environment in which the individual lived before and now is associated not only with a risk that contributes to the illness, but can also serve as protection and aid in resilience during treatment. In the specific clinical case of this article, the continuity of treatment, the reduction of symptoms, the discovery of some key complications, and the updating of the diagnosis were only possible because there was a change in the patient's environment, which helped to make him increasingly participatory in the treatment.

After the diagnosis, two concerns guided the clinical observation of the professionals involved: comorbidities and the action of medications. This precaution exists to avoid the risk of a manic episode and the return of more severe symptoms, such as psychotic ones, as this would mean a relapse and a very damaging recurrence for the patient, especially during a period of symptom stabilization.

Regarding medications, “despite the proven efficacy of several medications for the treatment of bipolar disorder, lithium is the only medication considered fundamental as a mood stabilizer” (Scaini *et al*, 2020). Lithium is frequently prescribed for patients who experience acute manic episodes, serving both for treatment

and maintenance, with the goal of preventing new episodes. However, it does not have a potent antidepressant effect, which can be problematic for those with frequent depressive episodes, because there is a susceptibility to manic or hypomanic switching with the use of antidepressants. Therefore, this interaction needs to be carefully considered until the right combination is found.

For cases like that of the patient discussed in this article, where lithium did not respond well to treatment, the medication of choice is sodium divalproate (Depakote). In addition to valproate, carbamazepine, an anticonvulsant in the same class as valproate, may also be prescribed. In parallel, an antipsychotic may also be chosen, among which there are typical and atypical antipsychotics. Typical antipsychotics include haloperidol and chlorpromazine, while atypical antipsychotics primarily include aripiprazole, clozapine, olanzapine, quetiapine, risperidone, ziprasidone, and asenapine. All of these listed medications have also demonstrated efficacy in research. (Scaini *et al*, 2020)

Most antipsychotics are approved for the acute treatment of mania, with the exception of clozapine, and can be used for the maintenance of the clinical picture of bipolar disorder, mainly olanzapine, aripiprazole, and quetiapine (Schatzberg & DeBattista, 2017). These are precisely the medications prescribed in the clinical case of this article, all of which were effective during the period they were used. Quetiapine was the first, then aripiprazole, and finally the patient resumed using olanzapine, which had been used years before. However, what is being sought with this information is not only about the change in medications, but also the reason behind these modifications, which are the side effects.

During the process of using psychopharmacological medications, there is a very important aspect that the professional needs to be aware of to act if side effects are observed. These effects can occur both during the medication adaptation period (at the beginning of use) and during use over the months. At this point, they are residual effects, to which the patient must build tolerance over time. If the patient has significant difficulty adapting to the effects, a specific, preventative action by the professional is necessary. This involves conducting a psychoeducation process covering the medication's function, side effects, and which options the patient can tolerate based on their clinical history.

This psychoeducational process is essential because it facilitates timely medication changes without harming treatment, since insisting on continuing with medication that is not as effective and greatly bothers the patient can lead to treatment abandonment, for example. This act can harm the entire clinical process that was being carried out and cause negative emotional, social, relational, and financial consequences for the patient with bipolar disorder (Chakrabarti & Singh, 2022).

On the other hand, antipsychotics play an important role in the treatment of bipolar disorder because they have "proven to be versatile, fast-acting, and more effective in depressive phases, where mood stabilizers such as lithium and valproate are not equally effective". They serve as an alternative to antidepressants, as some can trigger a manic switch as mentioned earlier. (Schatzberg & DeBattista, 2017)

Regarding olanzapine (the current antipsychotic used by the patient in the clinical case), it was the first atypical antipsychotic to be approved for the treatment of acute mania, and the third, along with lithium and lamotrigine, to demonstrate benefits in preventing mania and depression in bipolar I patients. Its most well-known side effects are akathisia, as well as increased weight gain and sedation (less so for the patient than with quetiapine). (Schatzberg & DeBattista, 2017)

Regarding aripiprazole, it appears to significantly reduce the irritability, mood swings, and aggression that occur in acute mania (Schatzberg & DeBattista, p. 206, 2017). Research supports its effectiveness in the maintenance treatment of Type I Bipolar Disorder, as it helps delay the onset of mania. However, aripiprazole can cause some side effects, such as sedation and extrapyramidal motor symptoms (EPS), especially in children and adolescents. Akathisia, an example of EPS, is more common in adults. In fact, this was the effect that most distressed the patient, especially when resting or going to sleep, in addition to muscle rigidity and dystonia, which greatly affected sleep and work performance—two fundamental problems for him.

Finally, quetiapine, which "is an effective medication for the acute treatment of mania, in addition to helping reduce anxiety in bipolar depression, and may have significant antidepressant properties" (Schatzberg & DeBattista, p. 202, 2017). Although it is an excellent medication for various mental disorders, it has side effects such as drowsiness and dizziness, which may be tolerable for most people. Still, for those with specific sleep problems (hypersomnia) or who work driving, it would be necessary to find ways to minimize the difficulties and adapt. Other medications that can be used as adjuncts along with antipsychotics and mood stabilizers are benzodiazepines, which participate in treatment for a period to help with sleep, anxiety, and agitation that patients with acute mania may experience. (Schatzberg & DeBattista, 2017).

In addition to medications and comorbidities (which will be discussed later), a very problematic and concerning issue that occurred in this clinical case and may occur with other patients with bipolar disorder is the depressive episode phase. According to Schatzberg (p. 251, 2017), "depression is the predominant mood state in bipolar disorder. Individuals with type I bipolar disorder spend about 32% of their lives in a depressive state, while 9% are in a manic state and 6% in mixed or cyclical states." Furthermore, it is the most difficult to treat, and as the medication section demonstrates, there are few drugs that effectively treat bipolar depression without causing undesirable results, as there is a high risk not only of relapse but also of suicide attempts due to increased energy, anxiety, and depressive symptoms.

In the treatment of bipolar disorder (BAD), professionals need to carefully monitor the potential development of comorbidities. There is a high risk of their occurrence, which consequently increases mortality rates. Some types of comorbidities and medical conditions associated with BAD include: cardiovascular diseases, diabetes mellitus, injuries caused by external factors, and respiratory diseases. Due to comorbidities, the life expectancy of individuals with BAD is reduced by 9 years compared to the general population.

Finally, a factor that directly influenced the treatment was that both professionals attending the patient, the psychologist and the psychiatrist, focused on listening and not just on standard protocols and treatments. Maintaining a focus solely on standard treatments reduces the experiences in a person's life and fails to address the difficulties that certain treatments can create. This is why it was only after several years, after seeing various professionals and using various medications, that the symptomatic picture became more stable, as the patient began to be treated by both a psychologist and a psychiatrist for a considerable period.

When we listen, we can understand why some situations and symptoms are more harmful to one patient than to others; we see how they react to what makes sense or not during treatment, giving them an active role in this process. This entire process is a two-way street, and they need to be active participants in their

own treatment; how they dealt with their problems before and how they deal with them now will directly influence their improvement. (Katz, 2019)

7. Final Considerations

When we receive a patient, even an adult, we must be aware that they come to the clinic already having a life history with and without mental disorders. Therefore, it is invariably impossible to ignore these experiences when accompanying the patient from the initial assessment to treatment. In some cases, such as the one discussed in this article, it is demonstrated that when the individual was a child, they responded "to the place reserved for them in the culture and within the family that received them" (Katz, 2019). For a child, this place will function differently, and their response will also be equivalent to their understanding. They may accept living in an extremely chaotic environment, reject or transform all layers of absorbed information, and this will be reflected in their psychic structure and mental health. (Katz, 2019)

Aligning the context of mental health in childhood and adolescence with mental disorders, in the case of Bipolar Affective Disorder, it is not only the complexity of the clinical picture that makes it more difficult to understand, but also the influence that exposure to the family and social environment can have, not only before the appearance of the first symptoms, but also after the episodes. Checking the patient's life context, who they live with, and whether a support network exists during the anamnesis process and initial interviews is fundamental, not only to understand how much the environment may be contributing to the patient's illness, but also to determine if there will be support from someone important during treatment.

Depending on when the first symptoms are noticed, the patient with Bipolar Disorder may end up facing residual mood symptoms, cognitive and functional impairment, psychosocial disability, and decreased quality of life, even with the best treatment. This happens because it is increasingly noted that bipolar disorder is a progressive condition, where delayed diagnosis and inadequate treatment can lead to the continuation of mood episodes, some symptoms that are disabling and resistant, the development of comorbidities, etc. (Scaini *et al*, 2020).

Even with a prognosis that seems quite negative, due to the many variables and complex contexts discussed in this article, with good treatment, it is possible to reverse a large part of the consequences that the episodes, crises, and outbreaks of Bipolar Disorder can cause in people's lives. The psychiatrist's work, with pharmacological intervention and psychotherapeutic treatment together, is fundamental because it provides a reduction in residual symptoms, prevention against recurrence of episodes, and a better quality of life for the patient, their family, and those who live directly with them. Alongside working with the symptomatology, psychotherapy can also help the patient cope with critical and stressful situations that often previously served as triggers for acute crises. (Soares *et al*, 2024)

The construction of this work revolved around addressing a line of reasoning that can occur in quite complex cases, where the professional often encounters overlapping symptoms, a series of complaints and demands from the patient and sometimes even from family members, with little involvement of the patient in the treatment, in addition to the doubts and questions themselves during the clinical analysis. Therefore, it is hoped that the necessary care that the professional needs to take, the most important information to clarify the overlaps, and the importance

of a multidisciplinary approach with those attending to the patient have become easily understandable.

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The Business Case for Dementia-Competent Hospitals: Analyzing the Financial Return on Investment of Specialized Staff Training and Care Models

Article Record

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PEER REVIEW

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Abstract

Dementia is now a defining financial and operational challenge for US hospitals. Healthcare costs for an individual living with dementia average nearly four times those of an individual without it (\$19,956 vs. \$5,394 annually), and patients with dementia face longer lengths of stay and higher rates of preventable complications. With the over-85 population projected to double by 2040, this pressure will only intensify. Specialized staff training and comprehensive care models are not clinical add-ons but strategic financial investments.

Evidence-based programs demonstrate measurable returns: the Care Ecosystem saves \$475.80 per member per month, and the Eskenazi Health Aging Brain Care program produces net annual savings of \$980–\$2,856 per patient against a program cost of \$618. Hospitals with excellent patient experience ratings achieve a 4.7% net margin compared with 1.8% for low-rated hospitals — and dementia-friendly care directly improves experience for the 40% of hospitalizations involving older adults. Trained staff also experience less burnout, reducing costly turnover. The shift to value-based care has reversed the historical financial disincentive for these investments.

Strategic recommendations include: Pilot a multi-disciplinary initiative with administrative support and staff engagement from intake through discharge. Invest in care coordination and care partner support — the highest-yield drivers of cost savings. Adopt a value-based measurement framework tracking utilization, satisfaction, retention, and experience. Pursue strategic partnerships with community organizations and payers, including the CMS GUIDE Model. For hospital executives, the question is no longer whether to invest in dementia-competent care, but how to implement it effectively.

Dementia care

Hospital finance

Return on investment

Staff training

Value-based care

Readmission reduction

Person-centered care

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The Business Case for Dementia-Competent Hospitals: Analyzing the Financial Return on Investment of Specialized Staff Training and Care Models

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Keywords: *Dementia care, Hospital finance, Return on investment, Staff training, Value-based care, Readmission reduction, Person-centered care*

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1. An Economic Argument for Specialized Cognitive Care Training in Hospitals and Medical Centers

The financial landscape of modern healthcare is increasingly defined by the growing prevalence of chronic conditions and complex patient populations. Among these, the rising incidence of various forms of dementia presents a profound challenge and, simultaneously, a strategic opportunity. Yearly average healthcare costs in the US for an individual living with dementia, \$19,956, were found to be nearly quadruple the costs for an individual without dementia, \$5394.¹ This immense financial burden on the healthcare system is often mirrored by a severe personal financial crisis for affected individuals and their families. For example, within the first eight years of diagnosis, people living with dementia can see their out-of-pocket healthcare spending more than double, while their net worth can decline by over 60%.² This acute financial distress is so significant that it leads to a near doubling of enrollment in Medicaid, the safety-net program for

individuals living in poverty.² This personal financial crisis for those living with dementia and their care partners is not a problem external to the hospital but a direct driver of financial challenges to hospital systems around the country. When a patient's net worth is eroded and they transition to public assistance programs like Medicaid, the hospital's payer mix can shift toward lower-reimbursing sources. This transition creates a hidden operational burden, as the hospital must manage a portfolio of more complex claims with diminished revenue potential per patient and a higher risk of uncompensated care. Therefore, addressing the financial viability of a hospital's care for this population requires a holistic understanding that the patient's financial stability is intrinsically linked to the health system's bottom line. The profound impact of dementia on hospital finances is not limited to the payer mix. Patients living with dementia present with a unique set of challenges that can directly and negatively affect key operational metrics. Data from a large national cohort study show that patients with dementia faced a substantially higher risk of mortality

within 30 days of discharge.³ The higher prevalence of complex comorbidities further complicates care for patients living with dementia, contributing to longer lengths of stay and more intricate treatment pathways. For instance, patients with dementia have significantly higher rates of conditions such as heart failure, chronic kidney disease, hypertension, and ischemic heart disease compared to their non-dementia counterparts.³ With these factors in mind, the authors assert that there is a currently unmet need for collaborative care management programs for dementia due to the significant increase in dementia-related care costs. Specifically, specialized staff training in dementia-friendly practices should be seen as a strategic intervention to help reduce costs. By equipping staff with skills to help reduce patient agitation (one contributor to falls, injuries, and delirium), hospitals may prevent some costly complications.⁴ Readmissions incur significant costs for which hospitals may not be fully reimbursed, especially under emerging value-based payment models.⁵ The sheer number of dementia patients with comorbid conditions means these individuals require more complex and expensive care, making any intervention that reduces unnecessary utilization a direct contributor to improved fiscal resilience.³ Current estimates show that patients living with dementia receive their diagnosis, on average, 4 years into active symptoms of the disease.⁶ During this significant span between onset of symptoms and diagnosis, hospital resources are often used ineffectively, incurring large unnecessary costs.

2. Foundational Interventions and Evidence-Based Care Models

Recognizing and responding to the substantial financial and operational challenges posed by dementia care, several evidence-based care models and staff training programs have been developed. These interventions move beyond a narrow focus on pharmacological solutions to embrace person-centered, collaborative approaches that help address the full spectrum of patient and care partner needs. The goal is to not only equip staff with more effective evidence-based approaches to care, but to also lower the length of time a patient is hospitalized, reduce the need for the use of antipsychotic medication interventions, and ultimately reduce the costs associated with this patient mix—including readmissions. The key is providing staff with training in proven, evidence-based training programs to accomplish these outcomes.

A. Typology of Staff Training Initiatives

Effective staff training is not a uniform concept, but a diverse set of pedagogical models tailored to different audiences and objectives. One key model in dementia education is the Train-the-Trainer (TTT) approach, which is designed to increase the reach of dementia training by empowering a core group of trainers to educate their peers and other staff members. One controlled pilot of a TTT program for hospital staff found lower staff-rated agitation among trained-ward patients at day 4 to 5, an effect that was not maintained at the day 8 measurement, where the between-group difference was not significant.^{4,7} The effectiveness of this TTT model stems from its ability to be tailored to local contexts and to foster a team-based approach where skills are shared and embedded into daily practice.⁴

In contrast, Expert-Led Programs involve direct training from clinical or lived-experience specialists. In one study, a two-day interactive program for inpatient nurses, led by an expert, resulted in a reduction in role strain and improved confidence for the participants involved.⁴ Both TTT models and expert-led models were shown to improve staff knowledge and confidence.⁴

Given economic pressures on hospitals, Online Training and Certification Programs have also become an important aspect of staff education throughout the country. Evidence-based online programs offer scalability, consistent content delivery, and flexibility for staff to complete modules at their own pace, which can be particularly valuable for hospitals with high staff turnover or geographically dispersed teams. However, online formats often lack the interactive, hands-on elements of live training, such as role-playing, immediate feedback, and the nuanced observation of behavioral cues of patients with dementia.⁸ Studies comparing online to in-person dementia training have produced mixed results. While knowledge acquisition has been shown to be comparable between modalities in some studies,⁸ other research has found greater improvement following in-person training over six months for primary care nurses.⁴ Staff in mixed-methods research have consistently reported that interactive face-to-face learning methods are most effective for behavior change, with some identifying passive methods such as e-learning and self-directed workbooks as barriers to applying knowledge in practice.⁸ Many organizations choose to adopt a blended approach, using online modules to provide foundational knowledge while reserving in-person sessions for practical application and interdisciplinary discussion.

The most effective hospital initiatives may integrate these approaches into a multi-component, blended, and interdisciplinary framework where online modules provide foundational knowledge while reserving in-person sessions for practical application and interdisciplinary discussion. For example, Wisconsin-based Fort HealthCare created an interdisciplinary task force that includes staff from nursing, radiology, and volunteer services to ensure broad organizational buy-in and a holistic approach to dementia-friendly planning.⁹ This inclusive model, which also connects with community organizations and incorporates the perspectives of patients and families, ensures that a commitment to dementia-friendly care is not confined to a single department but becomes a part of the hospital's operational ethos.⁹

B. Core Elements of Comprehensive Dementia Care Models

The financial gains from specialized training are most pronounced when staff skills are integrated into comprehensive care models that extend beyond the hospital walls. These models are built on several core principles:

- **Care Coordination and Navigation:** Programs like the Care Ecosystem and the Benjamin Rose Institute (BRI) Care Consultation utilize dedicated navigators or care consultants—often social workers, nurses, or other specialists—to coordinate complex care plans for patients and their care partners.¹⁰ This systematic approach ensures that patients' needs are met across different care settings. Although a recognized approach for families, care coordination is not necessarily a valid approach for education or skill training of hospital staff members.
- **Care Partner Support:** Research demonstrates the critical role of family care partners, who provide an average of 45 hours of unpaid care per month for people with dementia, compared to 13 hours for their peers.² Programs like the Living With Dementia Program, which was adapted from the Care Ecosystem model, are explicitly designed to enhance care partner self-efficacy and reduce their burden.¹¹
- **Standardized Staff Training.** Central to the authors' recommendations for the effectiveness of comprehensive dementia

care models in professional settings is the implementation of standardized, evidence-based staff training. Structured programs ensure that all personnel, regardless of role or experience level, acquire a consistent foundation of knowledge and practical skills in dementia care. Evidence indicates that such training improves staff confidence, reduces reliance on pharmacological interventions, and enhances patient outcomes, including fewer behavioral incidents and higher satisfaction among care partners.

- **Psychosocial and Non-Pharmacological Interventions:** The shift from a purely "deficit-oriented biomedical model" to one of person-centered care (PCC) is fundamental to these programs.¹² These interventions, including emotional and social support, home-based exercise, and information about the condition, have been shown to be the most cost-effective.¹²

In summary, the characteristics associated with effective hospital dementia training include person-centered care approaches, interactive and varied teaching methods, and supporting conditions such as champions, action plans, and care policies; blended, face-to-face delivery with interactive components was found more effective than online-only formats. Sustained change across the organization, however, was demonstrated in a minority of studies and remains inadequately evaluated.¹³

3. Quantifying the Financial Return on Investment (ROI)

The authors' strategic argument for investing in dementia-friendly initiatives rests on a compelling body of evidence to help reduce costs and provide a reasonable return on investment (ROI). This evidence demonstrates that specialized training and comprehensive care models generate a positive financial return through a combination of direct cost savings from reduced utilization and indirect benefits related to patient experience and workforce management.

A. Direct Cost Savings from Proactive Education

The most direct financial benefit of these programs is their ability to reduce the need for high-cost, avoidable care. In one research study that investigated the value of the Care Ecosystem model, the demonstrated mean savings was \$475.80 per member per month over a 12-month period compared to a control group.¹⁴ These significant savings were directly attributed to a reduction in ED, outpatient, and professional visits, validating the program's effectiveness in shifting care from reactive, expensive settings to proactive, managed ones.¹⁴

Similarly, in a separate study focused on a comprehensive interdisciplinary dementia care program at Eskenazi Health in Indianapolis, the annual program cost was approximately \$618 per patient, with net annual savings per patient of between \$980 and \$2,856.¹⁵ The savings were substantial and were achieved by reducing symptom burden and avoiding costly hospitalizations and ED visits.¹⁵

This evidence points to a single, powerful mechanism: a shift in the care model from reactive intervention to proactive prevention through staff education. A single ED visit or inpatient stay costs exponentially more than a month of coordinated care management. The documented savings are a direct testament to the value of investing in the upfront costs of training and care coordination to prevent a costly extension of the patient's stay and avoid unnecessary high-acuity care. The financial viability of these interventions stems from their capacity to act as a cost multiplier,

where a relatively small investment in training and coordinated care generates outsized savings by preventing or delaying the need for the most expensive forms of care.

B. The Value for Hospitals in Delaying Long-term Care Placement

The financial case for these programs extends beyond short-term utilization metrics to the long-term benefit of also delaying institutionalization to long-term care settings. In the home setting, for example, a multicomponent caregiver intervention, which included emotional support and home-based exercise, resulted in a total cost decrease of approximately \$11,360.87 and was found to be cost-effective with a 96% probability.¹² A major factor in these savings was the program's ability to delay nursing home admission and reduce the use of social and health care resources.¹²

In the hospital setting, a care model that provides the training and support needed to keep a patient at home for longer creates a significant win-win for both the medical center and family. Although the Genworth/CareScout Cost of Care Survey does not separately track memory care as a distinct category, industry analyses consistently estimate that memory care runs 20–30% higher than standard assisted living, which had a national median of \$74,400 per year in 2025,¹⁶ placing memory care in the estimated range of \$89,000–\$97,000 annually. The lifetime cost of care for a person living with dementia exceeds \$405,000, with approximately 70% of those costs borne by families through unpaid caregiving and out-of-pocket expenses.¹⁷ When a hospital's care model enables a patient to remain in their home, it reduces the patient's reliance on high-cost, long-term care and diminishes the immense financial burden on families and government programs like Medicaid.¹⁸ These outcomes position hospitals as community-focused providers and strengthen their performance under value-based payment arrangements, including the GUIDE Model from Center for Medicare & Medicaid Services (CMS).¹⁹

C. The Holistic ROI Engine: Patient Experience and Workforce Management

The direct cost savings from reduced utilization and delayed institutionalization represent only part of the full financial picture. The most successful initiatives also generate powerful indirect financial benefits that improve the hospital's overall financial health and operational sustainability.

A strong link exists between patient-reported experience and hospital profitability. Research from Deloitte found that hospitals with "excellent" patient ratings had a net margin of 4.7%, on average, compared to just 1.8% for hospitals with "low" ratings.²⁰ This financial correlation is driven by several mechanisms, including increased patient volume, strengthened customer loyalty, and improved reputation through word-of-mouth referrals.^{21,22} Older adults account for about 40% of hospital stays,²³ so gains in this group's experience apply to a large share of a hospital's patient volume.

This financial viability is further amplified by improved workforce management. Strained staff resources due to under-resourced patient care lead to a stressful work environment, which fosters employee burnout and costly turnover.²⁴ The financial burden of recruiting, onboarding, and training new staff is a heavy and recurring cost that strains an already precarious revenue cycle.²⁴ Training staff on dementia-friendly care, particularly aspects that enhance nurse-patient engagement, reduces the stress associated with caring for complex patients and improves family satisfaction with the hospital or medical center. This, in turn, improves staff morale and retention, creating a self-reinforcing cycle. A highly engaged staff provides better care, which improves patient experience,

Table 1. The ROI of Leading Dementia Care Models

Model Name	Annual Program Cost per Patient	Net Annual Savings per Patient	Primary Source of Savings
Aging Brain Care (ABC) Program ¹⁵	~\$618	~\$980 to \$2,856	Reduced hospital admissions and ED visits.
Care Ecosystem Program ¹⁴	~\$975.36	~\$4,734.24*	Fewer ED, outpatient, and professional visits.
Multicomponent Caregiver Intervention ¹²	Not specified	~\$11,360**	Delayed nursing home admissions, reduced social and health care costs.

Note. All financial figures are reported in U.S. dollars. The figures, time frames, and methodologies vary across the cited studies, and direct comparison between programs should be made with caution. Program structures, patient populations, settings, and measurement approaches differ substantially.

*\$4,734.24 is the net annual savings per patient: the study's modeled difference-in-differences reduction in cost of care, \$475.80 per member per month, minus the program cost of \$81.28 per member per month, which equals \$394.52 per member per month, multiplied by 12 months.¹⁴ The study reports the gross cost-of-care savings (\$5,709.60 per year) and the program cost (\$975.36 per year) separately. The same study also reports an overall return on investment of 5.85, a broader measure that adds risk-adjusted payment revenue to the cost-of-care savings; that broader figure is not used here.

**Total cost decrease of approximately \$11,360.87 converted from the original study value of €10,437, reported in Birkenhäger-Gillesse et al.¹² The figure represents a one-time total cost reduction observed during the multi-year study period, not a recurring annual savings. The intervention was a multicomponent caregiver training program; the cost reduction was driven by reduced healthcare and social care utilization over the first year following the intervention, with a trend toward fewer nursing home admissions.

Table 2. Key Financial and Operational Drivers of the Business Case

Benefit Category	Financial Metric	Quantitative Evidence	Causal Pathway
Direct Cost Savings	Reduced Utilization	Care Ecosystem showed mean savings of \$475.80 per member per month (PMPM) through fewer ED and outpatient visits. ¹⁴	Care Coordination -> Proactive management -> Fewer avoidable, high-cost visits.
Indirect Revenue Gain	Higher Patient Experience Ratings	Hospitals with "excellent" ratings had a 4.7% net margin vs. 1.8% for "low" ratings. ²⁰	Improved care -> Higher patient satisfaction -> Increased loyalty, referrals, and patient volume.
Workforce Efficiency	Lower Staff Turnover and Burnout	Strained resources and high patient-to-staff ratios lead to burnout and costly turnover. ²⁴	Specialized training -> Increased staff confidence and reduced stress -> Improved morale -> Higher retention -> Reduced recruitment and training costs.
Market Positioning	Alignment with Payer Goals	CMS GUIDE Model aims to reduce Medicare/Medicaid expenditures by lowering hospitalizations and ED use. ¹⁹	Patient-centered care models -> Alignment with value-based payment goals -> Increased opportunity for new revenue streams.

and better patient experience is linked to higher profitability.²⁰ The ROI is not a single, isolated metric but a holistic improvement to the hospital's reputation, workforce, and financial performance.

4. Strategic and Operational Considerations

While the financial case for specialized training is compelling, the implementation and measurement of these initiatives are not without complexity. An expert analysis must address the inherent challenges of proving a direct causal link and the barriers to successful implementation.

A. The Challenges of Measuring ROI in Healthcare

Quantifying the return on investment in healthcare is uniquely difficult. The financial return often lies beyond the reach of traditional financial metrics, with challenges in formally distinguishing ROI from cost-benefit analyses.^{25,26} It is nearly impossible to isolate the impact of a single intervention in a complex system where a patient's improved outcome may be influenced by new medications, coordinated care, and community-based support all at once. This challenge is compounded by the fact that the most valuable benefits—such as a nurse's compassionate care or the long-term trust a hospital builds within its community—are intangible and resist easy capture in a spreadsheet.

The foundation of any robust ROI measurement is high-quality, integrated data, which many healthcare organizations lack. Critical information is often fragmented across incompatible systems, with patient data in Electronic Health Records (EHRs), financial data in billing systems, and quality metrics in departmental

databases. This lack of a unified data infrastructure makes comprehensive analysis difficult and may lead to questionable results. The challenge here is not that interventional programs lack a return but that traditional measurement methods are ill-equipped to capture their full value.²⁷ A hospital's financial analysis must therefore shift from a narrow, fee-for-service perspective to a value-based care framework that tracks a broader portfolio of metrics, including patient utilization, caregiver satisfaction, staff retention, and patient experience scores.²⁷

B. Barriers to Implementation

Beyond measurement, there are real-world operational barriers to launching and scaling these initiatives. On the staff side, common challenges include a lack of dedicated time for training and difficulty in stepping away from clinical care to attend training sessions, underscoring the need for flexible, self-paced or on-the-job learning models.^{4,8}

At the organizational level, initiatives can fail due to a lack of institutional support and dedicated financial resources.⁸ Executives must provide support from the outset and allocate funds not just for the initial training but for ongoing education and equipment.⁹ The traditional fee-for-service model creates a disincentive for implementing programs with services like case management that are often not reimbursed.¹⁰ However, these very challenges are evolving into key opportunities.

Reviews of dementia-care training report small and inconsistent effects on resident aggression and on staff wellbeing, of variable study quality, with gains that often fade after the intervention.²⁸

5. Navigating the Shift to Value-Based Care

The healthcare landscape is in a fundamental shift, moving away from a traditional fee-for-service model toward value-based care. This transition directly supports the business case for specialized dementia care. CMS is actively piloting new payment structures, such as the GUIDE Model, which focuses on comprehensive, coordinated dementia care.¹⁹ This model aims to reduce Medicare and Medicaid expenditures by lowering hospitalizations, ED use, and the need for post-acute or long-term care.¹⁹ By aligning with these new models, health systems can overcome the financial barriers to implementing and scaling dementia-friendly initiatives and can even create new, sustainable revenue streams that reward better patient outcomes.

6. Conclusion and Strategic Recommendations

The analysis indicates that specialized staff training and comprehensive care models for individuals living with dementia are not merely clinical best practices, but financially sound strategic investments. The financial return is derived from a combination of direct cost savings achieved through reduced utilization and powerful indirect benefits that improve patient experience, staff morale, and market reputation. While traditional fee-for-service metrics struggle to capture this holistic value, the shift to value-based care models and emerging payment structures provides a clear financial pathway forward.

Based on this evidence, health system executives should consider implementing the following multi-component, blended, interdisciplinary strategic recommendations to build a successful and financially viable dementia-friendly hospital:

1. **Pilot a Multi-Disciplinary Initiative:** Do not limit the focus to nursing departments. Form an interdisciplinary task force with administrative support from the outset, engaging staff from every department that interacts with patients, from intake to discharge.⁹ This approach ensures broad organizational buy-in and embeds dementia-friendly principles into the hospital's culture.
2. **Invest in Care Coordination and Care Partner Support:** The data consistently demonstrates that the most significant cost savings come from preventing institutionalization and reducing avoidable utilization. Allocate resources for dedicated care navigators and programs that provide ongoing support and education to family caregivers, recognizing their immense value as partners in care.¹⁰
3. **Leverage a Value-Based Care Framework:** Recognize that the ROI for these initiatives cannot be captured by a single financial metric. Shift the focus of analysis to a portfolio of key performance indicators that includes patient utilization, care partner satisfaction, staff retention rates, and patient experience scores.²⁷ This will provide a more comprehensive and accurate picture of the program's value.
4. **Pursue Strategic Partnerships:** Connect with community-based organizations, dementia-competent coalitions, and government payers to align with new payment models like the CMS GUIDE Model. Such collaborations can provide not only valuable resources and expertise but also access to new revenue streams that are directly tied to the very outcomes these programs are designed to achieve.²⁹

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Development of Innovative Strategies for Early Detection, Prevention, and Control of Emerging Infectious Diseases in the United States Through Integrated Public Health Systems

Article Record

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Abstract

Background: As strikingly shown by the series of shocks—H1N1 influenza, MERS-CoV, Ebola, Zika, and most recently the SARS-CoV-2 epidemic, which claimed more than 1.2 million lives in the United States and caused an projected \$14 trillion in combined direct and indirect economic damage—the emergence and re-emergence of new infectious diseases is an ongoing and increasing danger to U.S. public health security. These repeated cautions notwithstanding, the United States still lacks a totally integrated, real-time national infectious disease early warning system able to identify new pathogen signals with the speed and spatial resolution needed for successful pre-epidemic response. This study offers and assesses an Integrated Early Warning and Containment System (IEWACS) framework meant to methodically improve U.S. capability for early identification, prevention, and management of new infectious diseases by combining digital epidemiology, genomic surveillance, community health informatics, and cross-sector coordination tools. A mixed-methods technique using narrative systematic review, expert consensus analysis, and scenario-based simulation modeling was used. Synthesized were seven federal policy documents, four overseas epidemic response case studies, and eighty-one peer-reviewed articles. Using epidemiological data from U.S. epidemic histories (2009–2024), simulation modeling—minimal, moderate, and full deployment—estimated expected detection acceleration and containment effectiveness across three IEWACS implementation circumstances. Stakeholder views were included by means of organized synthesis of openly accessible expert testimony submitted to HHS, CDC, and Congressional hearings on pandemic preparedness from 2020–2025.

Outcomes: Compared to baseline systems, full IEWACS installation was expected to cut mean time from pathogen emergence to confirmed public health warning by 8.3 days (95% CI: 5.1–11.5 days)—a decrease that, applied retroactively to the SARS-CoV-2 emergence timeline, would have allowed significant containment intervention roughly two incubation cycles ahead of the first confirmed U.S. case cluster. Integrating genomic surveillance was found to be the single best-yielding component for detection improvement, lowering the expected 3.2 days from a historical average of 16 days. Integrated with wastewater epidemiology and emergency department chief complaint data, community-based digital symptom surveillance added a 4.1-day detecting edge over clinical laboratory-dependent methods only.

Finally,: Next-generation U.S. infectious disease early...

Full abstract continues on the metadata continuation sheet.

emerging infectious diseases

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AUTHOR CONTRIBUTION MATRIX

Dr. Geneva T Igwama §Ø | Validation, Formal analysis, Resources

FULL ABSTRACT

Background:

As strikingly shown by the series of shocks—H1N1 influenza, MERS-CoV, Ebola, Zika, and most recently the SARS-CoV-2 epidemic, which claimed more than 1.2 million lives in the United States and caused an projected \$14 trillion in combined direct and indirect economic damage—the emergence and re-emergence of new infectious diseases is an ongoing and increasing danger to U.S. public health security. These repeated cautions notwithstanding, the United States still lacks a totally integrated, real-time national infectious disease early warning system able to identify new pathogen signals with the speed and spatial resolution needed for successful pre-epidemic response. This study offers and assesses an Integrated Early Warning and Containment System (IEWACS) framework meant to methodically improve U.S. capability for early identification, prevention, and management of new infectious diseases by combining digital epidemiology, genomic surveillance, community health informatics, and cross-sector coordination tools. A mixed-methods technique using narrative systematic review, expert consensus analysis, and scenario-based simulation modeling was used. Synthesized were seven federal policy documents, four overseas epidemic response case studies, and eighty-one peer-reviewed articles. Using epidemiological data from U.S. epidemic histories (2009–2024), simulation modeling—minimal, moderate, and full deployment—estimated expected detection acceleration and containment effectiveness across three IEWACS implementation circumstances. Stakeholder views were included by means of organized synthesis of openly accessible expert testimony submitted to HHS, CDC, and Congressional hearings on pandemic preparedness from 2020–2025.

Outcomes:

Compared to baseline systems, full IEWACS installation was expected to cut mean time from pathogen emergence to confirmed public health warning by 8.3 days (95% CI: 5.1–11.5 days)—a decrease that, applied retroactively to the SARS-CoV-2 emergence timeline, would have allowed significant containment intervention roughly two incubation cycles ahead of the first confirmed U.S. case cluster. Integrating genomic surveillance was found to be the single best-yielding component for detection improvement, lowering the expected 3.2 days from a historical average of 16 days. Integrated with wastewater epidemiology and emergency department chief complaint data, community-based digital symptom surveillance added a 4.1-day detecting edge over clinical laboratory-dependent methods only.

Finally,:

Next-generation U.S. infectious disease early warning is well-founded and operationally actionable thanks to the IEWACS framework. Its implementation calls for legislative funding in CDC Core Capabilities, growth of the National Wastewater Surveillance System, speed-up of whole-genome sequencing integration across public health labs, and creation of a National Digital Epidemiology Center with real-time data aggregation power. The next pandemic’s human and financial cost of delayed diagnosis will exceed the expense of developing the infrastructure that could stop it.

Development of Innovative Strategies for Early Detection, Prevention, and Control of Emerging Infectious Diseases in the United States Through Integrated Public Health Systems

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Abstract

Background: As strikingly shown by the series of shocks—H1N1 influenza, MERS-CoV, Ebola, Zika, and most recently the SARS-CoV-2 epidemic, which claimed more than 1.2 million lives in the United States and caused an projected \$14 trillion in combined direct and indirect economic damage—the emergence and re-emergence of new infectious diseases is an ongoing and increasing danger to U.S. public health security. These repeated cautions notwithstanding, the United States still lacks a totally integrated, real-time national infectious disease early warning system able to identify new pathogen signals with the speed and spatial resolution needed for successful pre-epidemic response. This study offers and assesses an Integrated Early Warning and Containment System (IEWACS) framework meant to methodically improve U.S. capability for early identification, prevention, and management of new infectious diseases by combining digital epidemiology, genomic surveillance, community health informatics, and cross-sector coordination tools. A mixed-methods technique using narrative systematic review, expert consensus analysis, and scenario-based simulation modeling was used. Synthesized were seven federal policy documents, four overseas epidemic response case studies, and eighty-one peer-reviewed articles. Using epidemiological data from U.S. epidemic histories (2009–2024), simulation modeling—minimal, moderate, and full deployment—estimated expected detection acceleration and containment effectiveness across three IEWACS implementation circumstances. Stakeholder views were included by means of organized synthesis of openly accessible expert testimony submitted to HHS, CDC, and Congressional hearings on pandemic preparedness from 2020–2025.

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Finally,: Next-generation U.S. infectious disease early warning is well-founded and operationally actionable thanks to the IEWACS framework. Its implementation calls for legislative funding in CDC Core Capabilities, growth of the National Wastewater Surveillance System, speed-up of whole-genome sequencing integration across public health labs, and creation of a National Digital Epidemiology Center with real-time data aggregation power. The next pandemic's human and financial cost of delayed diagnosis will exceed the expense of developing the infrastructure that could stop it.

Keywords: *emerging infectious diseases, early warning systems, digital epidemiology, wastewater surveillance, genomic surveillance, pandemic preparedness, integrated public health systems, IEWACS, syndromic surveillance, community health informatics*

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1. Introduction

The history of new infectious disease in the United States is one of delayed recognition in great part. U.S. public health officials verified the first domestic cases only after clinical labs noted unusual influenza A isolates that failed conventional subtype characterization—a detection process taking 17 days from possible index case exposure to national alert, during which time the virus had already seeded several state-level transmission chains (1).

Strict CDC surveillance case definitions tied to travel history from Wuhan and the lack of a working domestic diagnostic testing infrastructure let community transmission become widespread before its presence was confirmed a failure of detection architecture that cost the United States the containment window several East Asian countries effectively used to avoid the worst outbreak trajectories (2, 3).

These are typical errors. These are the expected results of a public health surveillance system that has always given passive case reporting priority over active signal detection, clinical laboratory confirmation over environmental and digital early warning, and departmental siloed operation over integrated cross-sector intelligence sharing. The United States spends about \$3.8 trillion a year on healthcare but only less than 3% of that amount goes to the public health infrastructure, including surveillance systems, which helps to avoid expensive clinical intervention-related sickness (4, 5).

However, in the decade since the Ebola outbreak motivated a new policy debate on U.S. readiness, the science and technology available for early detection and response have progressed dramatically. From around \$100 million per genome in 2001 to less than \$100 today, whole-genome sequencing costs have dropped to allow quick pathogen characterization at scale (6). Digital epidemiology tools—including participatory surveillance platforms, social media signal analysis, and internet search trend monitoring—have shown a 1-3 week lead-time advantage over conventional surveillance for influenza and other circulating respiratory infections (7). Used with amazing success during COVID-19, wastewater epidemiology has created the conceptual and operational framework for community-level pathogen monitoring that, by days to weeks, predates clinical case identification (8). Each of these—environmental sensor networks, integrated genomic pipelines, community health informatics platforms, and AI-driven alert systems—provides little but cumulative detecting benefits that, when carefully combined, might change U.S. early warning capability.

The Integrated Early Warning and Containment System (IEWACS) framework is presented in this study as a thorough, evidence-grounded structure for early identification, prevention, and control of developing infectious diseases in the United States. IEWACS combines the most scientifically confirmed elements of current epidemic identification science inside a design that is operationally consistent, policy-aligned, and health equity-conscious. It seeks to be a conceptual contribution to the academic work on pandemic readiness as well as a realistic plan for state and federal public health spending.

Keywords: emerging infectious diseases; early warning systems; digital epidemiology; wastewater surveillance; genomic surveillance; pandemic preparedness; integrated public health systems; IEWACS; syndromic surveillance; community health informatics

2. Literary review

2.1 Constraints of Modern U.S. Infectious Disease Surveillance

Although the Coronavirus Aid, Relief, and Economic Security (CARES) Act and following COVID-19-related legislation provided unmatched funds for the American public health system, the structural surveillance flaws exposed by the epidemic reaction still mostly go unaddressed at the systematic level. Established in 2022 with a \$200 million Congressional allocation, the CDC's Center for Forecasting and Outbreak Analytics shows a significant institutional commitment but is one node in a still-divided national surveillance network (9). The main channel for disease reporting from states to CDC, the National Notifiable Diseases Surveillance System (NNDSS), works on a 1970s-era data architecture with typical reporting delays of 1-3 weeks for most diseases and reliance on manual data entry at the local health department level in many areas (10).

Though their geographic reach varies and they are inherently limited to detecting increases in established clinical presenta-

tions rather than identifying genuinely new infections before syndromic patterns crystallize (11), sentinel surveillance networks—including BioSense Platform, FluView, and ESSENCE—offer important real-time signal detection for syndromic data from emergency rooms and sentinel clinics. Although significantly improved since the 2001 anthrax strikes, the laboratory response network infrastructure still falls short of the whole-genome sequencing throughput, bioinformatics capability, and inter-laboratory data sharing necessary to routinely identify fresh pathogen sequences within the 24-72-hour window an effective containment strategy calls for (12).

2.1. Syndromic Surveillance and Digital Epidemiology

Digital epidemiology is the application of voluntarily submitted health data, internet search queries, social media postings, mobile phone mobility data, electronic health record discharge data, and participation health reporting for infectious illness monitoring using digitally created data sources. Created at Boston Children's Hospital, HealthMap pioneered the use of natural language processing to look at online news sources and social media for signs of disease outbreaks. Between 2008 and 2016, it showed a two-week lead time over WHO alerts for several outbreaks (13). Though ultimately controversial because of overestimation problems linked to search behavior artifacts, Google Flu Trends proved the conceptual proof that digitally gathered population-level health-seeking behavior encodes epidemiologically relevant signals (14).

Participatory surveillance platforms including FluNearYou in North America and Influenzanet in Europe, which enlist volunteer panels to self-report weekly symptom status using smartphone apps, have shown useful application in identifying influenza-like sickness weeks before conventional surveillance systems log similar signals (15). Smartphone-based symptom tracking apps like the COVID Symptom Study app, which was launched by King's College

London and Zoe Health, helped millions of people keep track of their symptoms. They also gave real-time maps of how symptoms spread, which helped many countries make decisions about their policies (16).

2.2. Wastewater Epidemiological factors

One of the most important technical developments in infectious disease identification to come out of the COVID-19 pandemic is environmental monitoring using wastewater analysis. Multiple separate investigations revealed that the SARS-CoV-2 RNA signal in municipal sewage predicts confirmed case increases by 4-7 days, so offering a population-level signal detectable before clinical care-seeking behavior produces laboratory-confirmed cases (17). Established in September 2020, the CDC National Wastewater Surveillance System (NWSS) now gathers information from over 1,200 sites across 49 states—a revolutionary growth of environmental monitoring infrastructure that was almost nonexistent two years prior (18).

Beyond COVID-19, wastewater monitoring has been effectively used to identify poliovirus in New York and London, therefore offering the earliest unequivocal proof of circulating poliovirus in areas where clinical poliomyelitis had not yet been diagnosed and has shown technological viability for the discovery of influenza viruses, norovirus, drug-resistant organisms, and mpox (19, 20). From a readiness standpoint, wastewater epidemiology's generalizability as an early warning tool for a wide range of diseases is among its most strategically important features.

2.3. Observation of the Genome

The sudden drop in sequencing costs and the creation of portable sequencing devices like the Oxford Nanopore MinION, which allows real-time sequencing that can be used in the field, have moved whole-genome sequencing (WGS) from a research tool to a useful public health tool. Early identification of the Alpha, Delta, and Omicron variant lineages—most notably by the United Kingdom's COG-UK coalition, which sequenced a larger percentage of confirmed cases than any other national system—provided early warning of increased transmissibility before epidemiological signals were noticeable in case count data (21).

For the majority of 2020, SARS-CoV-2 genomic sequencing coverage in the United States remained below 1% of confirmed cases, compared to 10–15% in the United Kingdom—a major missed early warning sign (22). Though integration of sequencing data into real-time public health decision support systems is still lacking across most state health laboratory networks, the following investments in the National SARS-CoV-2 Strain Surveillance (NS3) initiative and the Centers of Excellence for Influenza Research and Response (CEIRRs) network have improved U.S. genomic surveillance capability.

3. The IEWACS structure

3.1. Theoretical framework

IEWACS is thought of as a five-layer combined surveillance system. Phase 1 (Environmental Sensing) covers wastewater epidemiology, air quality and aerosol monitoring, and wildlife sentinel surveillance nodes spread throughout ecological risk interfaces. Using real-time NLP pipelines, Layer 2 (Digital Signal Aggregation) mixes social media signal analysis, prescription dispensing trends from pharmacy networks, participative symptom reporting platforms, and emergency department syndromic surveillance data. Layer 3 (Genomic Intelligence) uses AI-driven phylogenetic anomaly detection to integrate ongoing WGS of garbage concentrates, clinical diagnostic remnant samples, and sentinel surveillance specimens into a cloud-based sequence repository. Via HL7 FHIR APIs, Layer 4 (Clinical Intelligence Integration) links IEWACS signal feeds with hospital EHR syndromic discharge data, ICU admissions for unusual presentations, and diagnostic laboratory result streams. For state and local health agencies, Layer 5 (Response Coordination Interface) offers jurisdiction-stratified alert dashboards; for CDC and HHS Emergency Operations Center integration, a federal emergency coordination layer; and public communication templates pre-approved for fast release following alert threshold breach.

3.2. Signal Fusion and Alert Generation

The IEWACS alert engine uses a Bayesian evidence fusion method that gives evolving pathogen threat signals dynamically updated posterior probabilities as data builds up across detection levels. Individual layer signals are given early weights based on historical outbreak detection data; environmental and digital signals are weighted more heavily early on (when they are most likely to precede clinical confirmation); genomic and clinical signals are weighted more heavily as outbreak confirmation goes on. Rather than utilizing consistent national criteria that might cause too many false-positive warnings in high-incidence settings or miss actual signals in low-incidence situations, alert thresholds depend on the location and show local public health response capacity and varied backdrop epidemiological baseline

Trained on 15 years of U.S. outbreak identification data, machine learning algorithms—especially gradient-boosted classifiers—assign confidence ratings to new signal patterns and provide differential threat profiles differentiating novel pathogen emergence from seasonal amplification of known agents. A human-in-the loop review process calls for epidemiologist approval of all Level 2 and higher alerts before outside communication, so maintaining expert opinion in the alert chain and greatly shortening the time between signal detection and decision-maker notification.

3.3 Integration of Community Health Informatics

IEWACS stands apart from other federal surveillance systems because it expressly incorporates community health informatics frameworkthe digital health sensor capability found at the local health agency, community health center, and personal practitioner level. Under a community data broker model, IEWACS suggests that local health agencies act as main nodes in the surveillance network, getting standardized data feeds from federally accredited IEWACS-compatible EHR systems, reporting environmental sensor readings, and compiling participatory surveillance registrant data in their areas. Rather than concentrating the surveillance load in federal facilities, this bottom-up data structure distributes it equitably throughout the public health system and guarantees that the detailed, geologically relevant information enabling focused intervention is created at the level where it is most actionable

The community broker approach directly tackles surveillance equity issues by requiring that IEWACS data infrastructure investments be assigned using a changed Social Vulnerability Index weighting that emphasizes historically underprivileged areas—which have always shown the highest death burdens from COVID-19 and past epidemics. Equity clauses of IEWACS forbid any county with SVI >0.75 from stay without garbage water monitoring, participative reporting system, or HL7-interoperable EHR connection past the third year of implementation.

4. Strategies

4.1 Modeling Method: Simulation

Scenario-based simulation modeling was carried out on the Epi-Model computer platform (R package version 2.3.1) to assess the predicted detection performance of IEWACS in relation to baseline U.S. surveillance systems. Three IEWACS deployment scenarios were simulated: little deployment (wastewater monitoring and FHIR EHR integration only); moderate deployment (wastewater, genomic, and digital syndromic); and full deployment with all five IEWACS layers working). Using published epidemiological parameters for pathogen generation time, serial interval, and case-to-detection delay distributions, every situation was applied to three historical epidemic models: the 2009 H1N1 pandemic; the 2014 Midwest enterovirus D68 outbreak; and the 2020 SARS-CoV-2 U.S. arrival.

The main results simulated were (1) days from index U.S. case to confirmed public health alert; (2) estimated cumulative case counts at time of first alert under every scenario; and (3) modeled containment success likelihood under scenario-specific detection timing assumptions. Monte Carlo simulation with 10,000 repetitions per situation produced uncertainty ranges around all main result predictions. Sensitivity studies looked at how robust projections were to changes in digital surveillance signal specificity, sequencing turnaround time, and wastewater-to-case lead time.

5. Outcomes

5.1. Estimates for detection Times

Relative to baseline surveillance systems over the three epidemic templates, full IEWACS rollout was expected to shorten mean time from pathogen development to validated public health warning by 8.3 days (95% CI: 5.1–11.5 days). Applied to the H1N1 2009 template, full IEWACS would have produced an alert 9.1 days prior to the actual first reported U.S. warning, hence cutting 11 days from index case to validated alert to around 2 days. Including the extended diagnostic testing failure phase, the SARS-CoV-2 2020 template was expected to help to cut detection lag by 12.4 days, with wastewater genomic sequencing providing the single biggest individual detecting progress—4.8 days.

Integration of genomic surveillance was found to be the single component improvement with the highest yield across all three outbreak models; it would lower pathogen characterization delay from a historical average of 16 days to an expected average of 3.2 days under complete deployment. Digital syndromic surveillance integration provided an average 4.1-day detection advantage; community participatory reporting added an estimated 2.6-day advantage. The total full IEWACS scenario cut anticipated U.S. case counts at time of first alert by 73% for the H1N1 template and 81% for the SARS-CoV-2 template compared to baseline system performance estimations.

5.2. Modelling of Containment Efficacy

Under IEWACS deployment circumstances across every template, the likelihood of containing—that is, of reducing overall epidemic size to below threshold—increased significantly. Assuming WHO-standard ring vaccination and isolation response strategies, under full deployment for a new influenza-template pathogen with R_0 of 1.6 and serial interval of 5 days, containment success probability rose from 11% under baseline detection timing to 47% under minimal IEWACS deployment and 71% under full deployment. For diseases with greater R_0 values resembling SARS-CoV-2 Omicron ($R_0 \approx 8 - 15$), containment viability was significantly lower over all situations, but early detection still significantly changed the course of the epidemic by compressing the pre-detection amplification phase that drives most early epidemic development.

5.3. Equity impact assessment

Under full IEWACS equity-weighted deployment guidelines, stratified analysis of expected IEWACS impact by county-level SVI showed that implementation benefits were disproportionately focused in high-vulnerability counties. High-SVI counties (SVI > 0.75) were expected to see a detection acceleration of 9.4 days against 7.1 days in low-SVI areas, hence reflecting the bigger detection gains possible in regions presently most underrepresented by the present monitoring system. The mortality impact of IEWACS is significantly affected by this equity gap: Earlier identification in just these communities might provide the most mortality benefit per detection day gained given that excess COVID-19 death in high-SVI counties surpassed that in low-SVI counties by a factor of 1.8 during the acute epidemic phase.

6. Dialogue

6.1. Integration Changing detection

The main understanding of the IEWACS approach is that the detection advantage comes from the methodical, real-time integration of different signal streams—each of which captures

a different epidemiological aspect of pathogen emergence—not from any one surveillance breakthrough. Environmental signals in wastewater record population-level exposure before individual clinical presentation; genomic signals define pathogen identity and evolutionary novelty before syndromic patterns crystallize; digital signals capture health-seeking behavior amplification before medical treatment is sought; and clinical signals offer the confirmatory specificity that justifies public health response authorization. A surveillance system relying on any one signal source will automatically run across the blind spots intrinsic in the detection technique of that source. Specifically, IEWACS is meant to help one layer's restrictions be offset by the strengths of other layers (23, 24).

Though maybe little on their own, the 8.3-day mean detection acceleration expected for full IEWACS implementation has great epidemiological meaning. A 8-day detection advantage for a pathogen with a 5-day serial interval and R_0 of 2 means around 1.6 reproductive cycles, or a time when an epidemic may grow by a factor of 3–4 if unchecked. Finding a new respiratory pathogen at 50 cases versus 200 cases is usually the difference between a controllable cluster and an ongoing epidemic, not just numerical (25).

6.2. Policy and Financial Requirements

There is strong scientific support for IEWACS. Equally compelling is the policy and investment case; yet, deliberate federal action not yet realized at the degree the evidence calls for is needed. The roughly \$675 million yearly Core Capacity grant CDC now provides for state and municipal public health preparation falls short of what is needed to enable the growth of the wastewater sensor network, public health laboratory sequencing capability, EHR interoperability investments, and digital surveillance platform licensing required for complete IEWACS deployment (26).

Due in 2023 and still awaiting significant change as of the time of writing, congressional reauthorization of the Pandemic and All-Hazards Preparedness Act (PAHPA) offers the main legislative vehicle for the financing authorizations IEWACS needs. The Global Health Security Agenda (to which the United States is still a devoted signatory) defines the worldwide normative framework for the detecting and reporting capabilities IEWACS actualizes domestically. Based on programmatic cost modeling of component infrastructure needs, a U.S. IEWACS investment of around \$4.2 billion over five years would produce estimated economic returns of more than \$74 billion under modest epidemic scenarios an economic return ratio of 17.6:1 that ought to meet any serious cost-benefit analysis (27).

6.3. Restrictions

The simulation modeling used in this study has the intrinsic limits of counterfactual epidemic analysis: real pathogen properties, public health response capacity, and institutional behavior in future events will always differ from the parametric assumptions included in historical templates. Given the institutional, legal, and technical obstacles to real-time health data exchange that remain across U.S. public health systems, detection estimates may be hopeful in assuming complete and fast data flow throughout the IEWACS network nodes. Though based on SVI-based stratification, the equity impact analysis cannot capture the whole complexity of social determinants influencing vulnerability to and response capacity inside high-SVI populations.

7. Conclusion

The COVID-19 epidemic was not a shocking tragedy. It was the expected result of a public health surveillance system without the integration, speed, and community-level sensitivity required to see what it could not bear not to notice. The IEWACS framework offered in this paper translates the hard-won lessons of that experience—and of H1N1, Ebola, Zika, and the many outbreak events before them—into a logical, evidence-based architectural design for improving U.S. infectious disease early warning capability.

Today, there is technology available to create IEWACS. The epidemiological data base justifying its component developments is mature and strong. Investment has clear financial arguments. Political will—the legislative commitment to fund the public health infrastructure investments—protects Americans not just from the next epidemic but also from the daily weight of vaccine-preventable, communicable, and environmentally transmitted illnesses that account for a significant portion of U.S. preventable death. Not a perfect world view is IEWACS. It is the next logical, morally required, and fiscally sensible phase in the continuous effort of creating a healthcare system consistent with the stated values of the country and real security demands.

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Predictors of Social Media use for Reproductive Health Seeking Behaviour among Students of Tertiary Institutions in Bauchi State, Nigeria

Article Record

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Abstract

Background: Social media (SM) has emerged as a dominant communication platform. It encompasses interactive tools like social networking sites, blogs, and content-sharing platforms that allow user-generated content, distinguishing it from traditional media. This shift from a monologue to a dialogue-based model of information exchange presents new opportunities for health communication.

Objective: To assess the predictors, knowledge and strategies associated with the use of social media (SM) for accessing reproductive health (RH) information among tertiary institution students in Bauchi State, Nigeria.

Methods: A descriptive cross-sectional study was conducted among 407 respondents. Data was Analysed using SPSS version 20.0, chi-square tests and logistic regression was used to identify predictors of SM use for RH information-seeking.

Results: The mean age of respondents was 23.60 ± 4.90 years, majority were male (64.1%). About 83.2% had good knowledge of using SM for RH information. Common RH topics sought included sex education (33.0%), abstinence from premarital sex (24.5%), and prevention of sexually transmitted infections (40.1%). Key barriers were poor internet connection (39.5%) and high cost (37.2%). The primary suggested strategy for enhancement was improved SM connection (45.4%). Logistic regression identified age group (AOR=5.47, 95% CI: 2.10-14.21) and type of institution (AOR=8.80, 95% CI: 2.00-38.73) as significant predictors of SM use for RH seeking behaviour.

Conclusion: Social media is a significant source of RH information for students. To maximize its potentials institutions should integrate digital literacy and SM-based RH education into their program

Social media

Reproductive Health

Bauchi

AI USE STATEMENT

No generative AI was used for analysis or results.

FUNDING

No external funding was declared for this work.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

DATA AVAILABILITY

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ARCHIVAL RECORD

Predictors of Social Media use for Reproductive Health Seeking Behaviour among Students of Tertiary Institutions in Bauchi State, Nigeria

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Abstract

Background: Social media (SM) has emerged as a dominant communication platform. It encompasses interactive tools like social networking sites, blogs, and content-sharing platforms that allow user-generated content, distinguishing it from traditional media. This shift from a monologue to a dialogue-based model of information exchange presents new opportunities for health communication.

Objective: To assess the predictors, knowledge and strategies associated with the use of social media (SM) for accessing reproductive health (RH) information among tertiary institution students in Bauchi State, Nigeria.

Methods: A descriptive cross-sectional study was conducted among 407 respondents. Data was Analysed using SPSS version 20.0, chi-square tests and logistic regression was used to identify predictors of SM use for RH information-seeking.

Results: The mean age of respondents was 23.60 ± 4.90 years, majority were male (64.1%). About 83.2% had good knowledge of using SM for RH information. Common RH topics sought included sex education (33.0%), abstinence from premarital sex (24.5%), and prevention of sexually transmitted infections (40.1%). Key barriers were poor internet connection (39.5%) and high cost (37.2%). The primary suggested strategy for enhancement was improved SM connection (45.4%). Logistic regression identified age group (AOR=5.47, 95% CI: 2.10-14.21) and type of institution (AOR=8.80, 95% CI: 2.00-38.73) as significant predictors of SM use for RH seeking behaviour.

Conclusion: Social media is a significant source of RH information for students. To maximize its potentials institutions should integrate digital literacy and SM-based RH education into their program

Keywords: *Social media, Reproductive Health, Bauchi*

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1. Introduction

Social media (SM) has evolved into a dominant communication platform, particularly among young people under the age of 45 [1]. It encompasses interactive tools like social networking sites, blogs, and content-sharing platforms that allow user-generated content, distinguishing it from traditional media [1]. This shift from a monologue to a dialogue-based model of information exchange presents new opportunities for health communication, including the potential for health professionals to disseminate information and for peers to offer support [2].

The means of seeking and sharing health information have transformed significantly [2]. For sexual and reproductive health (SRH), a critical area for adolescents and young adults, SM offers anonymity and ease of access, which can be advantageous for discussing sensitive topics often stigmatized in traditional settings [3, 4]. Young people globally bear a high burden of SRH challenges, including HIV/AIDS, other sexually transmitted infections (STIs), and unplanned pregnancies [5, 6]. In many

settings, including Nigeria, formal SRH education in institutions remains limited or censored [7], potentially driving youth to seek information from alternative sources like SM.

However, the use of SM for health information is not without risks. The lack of regulation can lead to misinformation, and excessive or unguided use may have negative consequences [8]. In Nigeria, with high internet and mobile phone penetration among youth, the link between SM and SRH behaviour is pronounced [9].

While existing studies have explored SM use broadly, there is a paucity of context-specific research on its role in SRH information-seeking among tertiary students in Northern Nigeria. This study, therefore, aimed to investigate the predictors, patterns, barriers, and facilitators of SM use for SRH information among tertiary institution students in Bauchi State, Nigeria.

2. Methods

2.1. Study design and area

A descriptive cross-sectional study was conducted in Bauchi State, North-East Nigeria. The state hosts several federal, state, and private tertiary institutions. The study sites included Abubakar Tafawa Balewa University (ATBU), Bauchi State University Gadau (BASUG), Federal Polytechnic Bauchi, Abubakar Tatari Ali Polytechnic, and the College of Education, Kangare.

2.2. Study population and sampling

The study population comprised students of the selected tertiary institutions. Students who were too sick or absent during data collection were excluded. The minimum sample size was calculated as 384 using the formula for single proportions, with a 52% awareness rate from a previous study [10], a 95% confidence level, and a 5% margin of error. After adding 10% for non-response, a sample size of 423 was used.

A multistage sampling technique was employed. Four institutions (25% of 16) were purposively selected. From each, 25% of faculties were selected, followed by 25% of departments within those faculties. Finally, respondents were selected from the sampled departments using systematic random sampling.

2.3. Data collection and instrument

Quantitative data were collected using a pre-tested, semi-structured, self-administered questionnaire adapted from previous studies [10]. The questionnaire covered five sections: (A) socio-demographic characteristics, (B) knowledge of SM as an SRH source, (C) use of SM for SRH information, (D) SM as a source of SRH-seeking behaviour, and (E) the relationship between SM use and SRH-seeking behaviour.

2.4. Data management and analysis

Data were cleaned, entered into Microsoft Excel, and analyzed using IBM SPSS version 20.0. Descriptive statistics were presented using frequencies and percentages. Knowledge was scored on a 10-point scale and categorized as good (6-10) or poor (0-5). The Chi-square test was used to determine associations between variables, with statistical significance set at $p \leq 0.05$. Variables significant at $p \leq 0.10$ in bivariate analysis were entered into a binary logistic regression model to identify independent predictors.

2.5. Ethical considerations

Ethical approval was obtained from the Bauchi State Research Ethical Committee. Permission was also sought from the heads of the respective institutions. Written informed consent was obtained from all participants, and confidentiality was maintained throughout the study.

3. Results

3.1. Socio-demographic characteristics

A total of 407 valid responses were retrieved from 423 distributed questionnaires, giving a 96.2% response rate. The mean age was 23.60 ± 4.90 years, with 68.3% aged 15-24 years. There were more males (64.1%) than females (35.9%). Most respondents were from universities (46.4%), followed by polytechnics (35.6%). The largest departmental representation was from Engineering (35.6%), and the majority were undergraduate students (41.3%) (Table 1).

Table 1. Socio-demographic Characteristics of the Respondents

Variables	Frequency	Percentage
Age Group (years)		
15 – 24	278	68.3
25 – 34	113	27.8
35 – 44	14	3.4
45 – 54	2	0.5
Sex		
Male	261	64.1
Female	146	35.9
Type of Institution		
University	189	46.4
Polytechnic	145	35.6
College of Education	73	18.0
Department		
Engineering	145	35.6
Economics	91	22.4
English/Social Studies	73	17.9
Vocational Training Ed.	56	13.8
Biological Sciences	42	10.3
Programme		
Undergraduate	168	41.3
ND	82	20.1
HND	63	15.5
NCE	46	11.3
Certificate	27	6.6
Postgraduate	21	5.2

3.2. Knowledge of social media for SRH information

Most respondents (83.2%) had good knowledge of using SM for RH information. The primary RH topics sought via SM were: methods to avoid STIs (40.1%), general sex education (33.0%), abstinence from premarital sex (24.5%), and avoidance of sexual abuse (25.1%). The main reasons for preferring SM were its perceived wealth of information (37.8%) and the privacy it offers (28.9%).

3.3. Barriers and strategies related to SM use for RH

The most frequently cited barriers to using SM for RH information were poor internet connection (39.5%) and the high cost of data/devices (Table 3).

Correspondingly, the top suggested strategies to enhance use were improved internet connection (45.4%) and reduced access costs (29.5%) (Table 4).

3.4. Predictors of SM use for SRH seeking behaviour

Bivariate analysis showed significant associations ($p < 0.05$) between SM use for SRH seeking behaviour and age group, type of institution, department, and type of programme (Table 5). After logistic regression analysis, age group and type of institution remained significant independent predictors.

Respondents in the younger age groups (15-24) were 5.5 times more likely to use SM for SRH information compared to older groups (Adjusted Odds Ratio, AOR=5.47, 95% CI: 2.10-14.21). University students were 8.8 times more likely to use SM for this purpose compared to their counterparts in other institutions (AOR=8.80, 95% CI: 2.00-38.73) (Table 5).

Table 2. Knowledge and Use of Social Media for RH Information

Variables	Frequency	Percentage
Knowledge Level		
Good (6–10)	339	83.2
Poor (0–5)	68	16.8
Indicate the RHI you have looked up or would enquire on social media:		
How to abstain from premarital sex?		
Yes	83	24.5
No	256	75.5
How to avoid contracting STDs?		
Yes	136	40.1
No	203	59.9
How to identify signs of STI?		
Yes	95	28.0
No	244	72.0
Health effects of female circumcision?		
Yes	49	14.5
No	290	85.5
Different methods of pregnancy prevention?		
Yes	72	21.2
No	267	78.8
Sexual abuse:		
Yes	85	25.1
No	254	74.9
How to maintain sexual hygiene:		
Yes	82	24.2
No	257	75.8
General sex education?		
Yes	112	33.0
No	227	67.0
Pornography display?		
Yes	27	8.0
No	312	92.0

Table 3. Barriers to Using Social Media for RH Information

Barriers	Frequency	Percentage
Poor social media connection	134	39.5
High cost of access tools	126	37.2
Parental restrictions	88	26.0
Limited device access	83	24.5
Ignorance of good SM sites	43	12.7
Ignorance of RH-seeking behaviour	42	12.4
Poor typing/search skills	28	8.3

Table 4. Suggested Strategies to Enhance SM Use for RH Information

Strategies	Frequency	Percentage
Improved SM connection	154	45.4
Acquisition of info literacy skills	103	30.4
Reduction in SM access cost	100	29.5
Improved SM search skills	89	26.3
Ownership of personal device	85	25.1
Enhanced computer skills	83	24.5
Less parental restriction	76	22.4

Table 5. Logistic Regression Analysis of Predictors of SM Use for SRH Seeking Behaviour

Variables	p-value	Adjusted OR	95% CI for AOR
Age group (15-24)	0.000*	5.467	2.103 – 14.213
Type of Institution	0.004*	8.804	2.001 – 38.731
Department	0.099	0.726	0.496 – 1.062
Programme	0.813	0.919	0.457 – 1.850

*Statistically significant

4. Discussion

This study found that SM is a widely used and recognized source of RH information among tertiary students in Bauchi State, with over 80% demonstrating good knowledge of its use for this purpose. This high awareness aligns with the global trend of youth engagement with digital platforms [3, 11]. The preference for SM was driven by its informational breadth and privacy, underscoring its value as a confidential space for addressing sensitive SRH topics often avoided in face-to-face interactions due to cultural stigma [4, 12].

The SRH topics sought—STI prevention, sex education, and abstinence—reflect the core concerns of this demographic. However, the lower reporting for topics like the health effects of female circumcision (14.5%) may indicate cultural sensitivities or a gap in available content [13]. The significant use of SM for “general sex education” may also serve as an umbrella term for those reluctant to specify precise needs, a behaviour noted in settings where adolescent sexuality is problematized [12].

Key barriers were infrastructural: poor internet connectivity and high access costs. This highlights a critical digital divide that limits the potential of SM as a health tool in this region, consistent with challenges noted in other low-resource settings [14]. The suggested strategies centred on mitigating these same barriers, emphasizing that improving physical and financial access is paramount.

The study identified younger age and being a university student as strong predictors of SM use for SRH information. The age finding is consistent with global patterns of digital adoption [1, 3]. The institutional effect may be related to differences in curriculum exposure, peer networks, or access to resources between university and non-university tertiary students.

A notable limitation was the hesitancy of some respondents, particularly females, to answer sensitive questions, potentially leading to social desirability bias. The cross-sectional design also limits causal inference. Furthermore, the findings are specific to Bauchi State and may not be generalizable to all Nigerian tertiary students.

5. Conclusion

Social media serves as a major, valued resource for RH information among tertiary students in Bauchi State, Nigeria. Its use is predicted by younger age and enrolment in a university. However, its effectiveness is hampered primarily by poor internet connectivity and the high cost of access.

5.1. Recommendations

1. Tertiary institutions and policymakers should collaborate with telecommunication companies to improve internet infrastructure on campuses and explore subsidized data plans for students.
2. Institutions should integrate comprehensive digital and health literacy training into orientation or general studies

programs to enhance students' skills in finding and evaluating online RH information.

3. Health promotion units within institutions should establish confidential, SM-based counselling services (e.g., via dedicated WhatsApp lines or Telegram bots) to provide accurate SRH information and referrals.
4. SRH educational programs on campus should be expanded to cover crucial topics like STI prevention, sexual hygiene, consent, and gender-based violence, complementing the information students seek online.
5. Future research should employ qualitative methods to gain deeper insights into the motivations, perceptions, and quality of information obtained through SM by this population.

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