

# Schizophrenia Treatment: Clozapine, LAIs, Technology and Equity with John Kane, MD and Lauren Hanna, MD

*Jason Wong, BA, Joseph Flaxer, MD, MPH, Julia Tartaglia, MD, David Puder, MD*

Only Dr. John Kane has any potential reported conflicts of interest:

Consultant to or Receives Honoraria:

Alkermes, Allergan, Boehringer-Ingelheim, Cerevel, Dainippon Sumitomo, H. Lundbeck, HealthRhythms, HLS, Indivior, Intracellular Therapies, Janssen Pharmaceutical, Johnson & Johnson, LB Pharmaceuticals, Merck, Minerva, Neurocrine, Newron, Novartis, NW PharmaTech, Otsuka, Roche, Saladax, Sunovion, Teva

Advisory Boards:

Cerevel, Click Therapeutics, Lundbeck, Merck, Newron, Novartis, Otsuka, Sumitomo, Teva

Grant Support:

Lundbeck, Otsuka, Janssen, Sunovion

Shareholder:

Vanguard Research Group (private), LB Pharmaceuticals, Inc. (private), North Shore Therapeutics (private), MedinCell (public), Sage (public)

Receives royalties

Up to Date

## Clozapine History

Clozapine is a second-generation antipsychotic used for treatment-resistant schizophrenia. Since its discovery in 1958, it has emerged as the sole FDA-approved therapy for treatment-resistant schizophrenia. Yet, its troubled history and gaps of knowledge have continued to prevent its effective use and contributed to its underutilization. In 1975, clozapine was banned in the United States due to reports in Finland describing rates of agranulocytosis of 0.05 to 2%. These were higher than rates among patients who had received standard psychotropic medications and led to a series of deaths (Idänpään-Heikkilä et al., 1975). As a result, the use of clozapine in the U.S. and further drug development was abruptly halted. Per clinical observations, particularly at Zucker Hillside Hospital (ZHH) where there were many hospitalized patients on clozapine, patients with a true diagnosis of schizophrenia had a very difficult time being weaned off due to psychotic decompensation and, when put back on clozapine, staff observed dramatic improvements in clinical status. Research led by John Kane, M.D. at ZHH designed what turned out to be a landmark study, leading clozapine to receive FDA approval in 1990 (Kane et al., 1988).

# Schizophrenia Treatment: Clozapine, LAIs, Technology and Equity with John Kane, MD and Lauren Hanna, MD

*Jason Wong, BA, Joseph Flaxer, MD, MPH, Julia Tartaglia, MD, David Puder, MD*

## Underutilization of Clozapine

Despite being the only FDA-approved medication for treatment-resistant schizophrenia, with fatality from agranulocytosis now being very rare, it remains underutilized. It is estimated that 30% of patients with schizophrenia are treatment resistant, but the utilization rate of clozapine in the U.S. is under 10% (Stroup et al., 2014). Furthermore, it is estimated that 20% of first-episode patients are treatment resistant, yet many do not receive clozapine despite this being a critical time to get the illness under control and optimize long-term outcomes (Demjaha et al., 2017; Lally et al., 2016; Kanahara et al., 2018).

In fact, research has shown that there is a case to be made for clozapine being used after the failure of one antipsychotic rather than two (Kahn et al., 2018). Clozapine is associated with lower rates of long-term hospitalizations, despite greater illness severity of patients who tend to receive it (Masuda et al., 2019). A 20-year follow-up study of physical morbidity and mortality in relationship to antipsychotic treatment in a nationwide cohort of 62,250 patients with schizophrenia suggested that long-term antipsychotic use does not increase severe physical morbidity leading to hospitalization, and is associated with substantially decreased mortality, especially among patients treated with clozapine (Taipale et al., 2020).

## Tips for Counseling Patients and Families on Clozapine

- In addition to presenting benefits and risks, it is important to share success stories.
  - There are many stories of subsets of clozapine responders for whom the medication was life-changing in dramatically positive ways.
- Like we do with many treatments in medicine, start with benefits and then move on to the risks.
  - Many clinicians will be anxious to convey all of the different and unique risks that clozapine carries, which is important, but often dominates the conversation in a way that is driven by the clinician.
  - Patients deserve to know the high potential upside.
- Recommend an adequate trial as a measure of whether to stay on it for a longer period.
  - Advise an initial 3- to 4-month trial to get a good sense of how life could be different and how the changes in symptoms and functional outcomes weigh against the side effects. Then, patients can make a more educated decision about a medication that could potentially be life-changing, rather than not trying it at all.

# Schizophrenia Treatment: Clozapine, LAIs, Technology and Equity with John Kane, MD and Lauren Hanna, MD

*Jason Wong, BA, Joseph Flaxer, MD, MPH, Julia Tartaglia, MD, David Puder, MD*

## Long-acting Injectables

Like clozapine, the long-acting injectables (LAIs) are highly underutilized despite being available for many years. They are often viewed as a hassle to use with more work for the clinician. Explaining the benefits and also discussing the risks with patients who initially may be reluctant takes effective training, time, and practice, but when done well can be effective at improving LAI use. An intervention that enacted training sessions with staff of multiple clinics helped to get LAI acceptance rate as high as 86% (Kane et al., 2020). Studies show that across all fields of medicine, about 50% of patients take medications as prescribed (Chaudri 2004).

In psychiatry, we are fortunate to have tools like LAI's that other fields of medicine do not have, and given the data that shows multiple benefits to LAI use, including increased time to rehospitalization, it makes sense to be offering these tools to patients earlier and more often (Kane et al., 2020). Additionally, LAIs have an important connection to clozapine, in that trialing an LAI before starting clozapine ensures adherence, helping to establish true treatment resistance. Patients are often labeled as treatment resistant when their decompensation is actually due to treatment nonadherence (McCutcheon et al., 2018).

## Tips for Counseling Patients on LAIs

- Self-reflect on biased ideas we may have internalized regarding LAIs.
  - Often, psychiatrists wait to offer LAIs to patients who “prove” they are “noncompliant” or who are “bad patients” or “aggressive.”
  - These views foster negativity toward LAIs and deprive patients of opportunities to use effective treatments.
  - This kind of language is often racially coded with bias against black and brown populations.
- Be mindful of prior trauma associated with injections.
  - Patients will likely recall traumatizing experiences of being administered injections against their will in the hospital during episodes of agitation.
  - Differentiate between emergency short-acting injections given involuntarily versus long-acting injections which are a treatment option that can help foster independence and decrease the risk of hospitalization.
- Introduce the idea of LAIs early in the treatment course in order to help normalize them as part of the standard of care treatment.

# Schizophrenia Treatment: Clozapine, LAIs, Technology and Equity with John Kane, MD and Lauren Hanna, MD

*Jason Wong, BA, Joseph Flaxer, MD, MPH, Julia Tartaglia, MD, David Puder, MD*

- Patients should be informed early in treatment that the recommended course is establishing efficacy and tolerability on oral medication, and then transitioning to an LAI.
- The LAI should be presented as a unique tool in psychiatry that we are fortunate to be able to offer.

## Recovery Model and Coordinated Specialty Care

The Recovery Model takes a stance of optimism about outcome from serious mental illness and focuses on empowerment, shared decision making, and helping clients find productive roles in line with their goals (Warner 2010). It decenters symptoms and treatment response as a sole focus and gives patients the dignity and autonomy to focus on what outcomes are most important to them. This allows for the dignity of risk and the dignity of going through a learning process if a decision that a patient makes does not end up working out as originally anticipated. The Recovery Model approach is closely tied to the practice of Coordinated Specialty Care (CSC) in the treatment of First Episode Psychosis (FEP). CSC consists of interventions including assertive case management, individual or group psychotherapy, supported employment and education services, family education and support, and low doses of select antipsychotic agents. The CSC framework for FEP is similar to the Assertive Community Treatment (ACT) model, but in contrast to ACT, CSC serves a younger population without established disability and has the capacity for out-of-office visits (but does not require them) (NASMHPD 2023).

## Racial Disparities in Diagnosis

As discussed extensively in episode 143, racial bias in diagnostic practice is an important contributing factor. Research shows that in diagnosis of psychotic illness, African American/Black patients have a rate, on average, of three to four times higher than Euro-American/White patients, and Latinx American/Hispanic patients are disproportionately diagnosed with psychotic disorders on average about three times higher compared to Euro-American/White patients (Schwartz & Blankenship, 2014).

There are several potential reasons for this. In addition to racial bias leading to potential misdiagnosis, there is other data that suggests a true disparity in illness prevalence related to social determinants of health. These findings suggest that racial and ethnic disparities in the rates of obstetric complications in the United States could contribute to a developmental trajectory toward psychosis. Additionally, chronic stress due to discrimination against racial and ethnic minoritized individuals can be linked to development of psychosis (Anglin et al., 2021).

# Schizophrenia Treatment: Clozapine, LAIs, Technology and Equity with John Kane, MD and Lauren Hanna, MD

*Jason Wong, BA, Joseph Flaxer, MD, MPH, Julia Tartaglia, MD, David Puder, MD*

## Socioculturally-sensitive Care and Supervision

Socioculturally-attuned psychiatric care is important across the board and is particularly relevant in treatment of patients with psychotic illness, given the above racial disparities discussed. It is vital for psychiatrists to develop effective practices around actively addressing sociocultural context within the patient-doctor relationship. Location of self practices, largely pioneered in the family therapy field, provide a thoughtful approach to dialogue in addressing how the identities of the therapist and the corresponding privilege or subjugation associated with these identities in society can play out in the therapeutic relationship.

Effective use of these practices signals that the therapist is open to exploring how these issues influence patients' lives (Watts-Jones 2010; Knudson-Martin 2019). Specifically, racial trauma is a topic that tends to be left out of conversations, even in standard care "trauma-informed" practices (Hardy 2023). Supervision around culturally-sensitive care for trainees is needed in order to teach socioculturally-attuned practices. This starts with culturally-sensitive supervision, which includes practices around location of self, as discussed above. This normalizes and invites conversations around privileged and subjugated identities of supervisor and trainee and how these factors may affect supervision dynamic (Hardy & Bobes, 2016).

## Neuromodulation and Psychedelics

- For patients resistant to clozapine, augmenting with ECT has added benefit (Petrides et al., 2015).
- 3,4-Methylenedioxy methamphetamine (MDMA) has emerged as a novel therapeutic that has potential for use in negative symptoms of schizophrenia. This is an important area of research, given that there are no FDA-approved treatments for negative symptoms, which are a major cause of functional impairment in disability in the illness (Arnovitz et al., 2022).

## Digital Psychiatry

Technology offers the potential to disrupt the way psychosis is managed and monitored. Researchers are interested in identifying markers of psychosis in order to detect relapse, which can allow for earlier treatment intervention and better monitoring of treatment response and medication adherence. Research has shown that the median duration of untreated psychosis in community treatment settings is more than 14 months (Addington et al., 2023). As access to digital technologies such as smartphones, wearables, and social media have become more

# Schizophrenia Treatment: Clozapine, LAIs, Technology and Equity with John Kane, MD and Lauren Hanna, MD

*Jason Wong, BA, Joseph Flaxer, MD, MPH, Julia Tartaglia, MD, David Puder, MD*

pervasive, researchers have begun examining this digital data for signals of relapse. This concept of using in-situ active and passive data from a person's smartphone to identify digital biomarkers of mental illness has been referred to as "digital phenotyping" (Torous et al., 2016).

At ZHH, researchers have begun to discover associations between social media and online activity and psychosis. One such research study examined online search activities in 105 patients with schizophrenia spectrum disorder compared to healthy volunteers and found differences in the frequency, timing and content of their search activity (Birnbaum et al., 2020). Furthermore, in later studies examining patient-generated social media activities from platforms such as Facebook and Instagram, researchers were able to identify distinct linguistic and behavioral patterns that were associated with schizophrenia spectrum disorders (Birnbaum et al., 2020; Hänsel et al., 2023). This research highlights the potential to utilize social media and online activity to create digital biomarkers for psychosis that could be used clinically to identify patients who have relapsed and potentially target interventions more quickly. In fact, the ZHH team is studying the potential of harnessing differences in search habits of people with psychosis in order to deliver advertisement-based interventions aimed at driving help-seeking behavior (Kirschenbaum et al., 2020; Birnbaum et al., 2017; Birnbaum et al., 2022).

In order to begin to implement this clinically, several institutions have begun creating "digital clinics" which integrate the use of mobile apps into psychiatric care through digital phenotyping as well as for digital interventions, such as journaling tools, mindfulness activities, medication reminders, and safety planning (King et al., 2023). This new clinical model of care has led to the emergence of a new clinical role, that of a "digital navigator" or a "digital health coach" (Wiśniewski et al., 2020). This is a team member with training in digital health whose role is to assist patients and providers in choosing apps and offering technical support.

However, with the adoption of such tools, it is important to consider the potential risks of such technologies. Data privacy is a main concern, as platforms that aggregate sensitive patient data are at risk of data leaks. A recent 2022 report by researchers at Mozilla found that nearly 60% of popular mental health apps had privacy practices that fell short of Mozilla's minimum standards (Mozilla 2022). Another potential negative impact is the risk of bias within technologies, which could exacerbate existing health inequities. For example, studies have shown that there is a potential for racial bias in algorithms (SITNFlash 2020). Thus, it will be important for developers of such technologies to utilize ethnically and racially diverse data sets when developing algorithms and to check for potential biases.

# **Schizophrenia Treatment: Clozapine, LAIs, Technology and Equity with John Kane, MD and Lauren Hanna, MD**

*Jason Wong, BA, Joseph Flaxer, MD, MPH, Julia Tartaglia, MD, David Puder, MD*

## **Note on the presenters:**

### **Dr. Kane:**

John M. Kane, MD. is Professor of Psychiatry and Molecular Medicine at The Donald and Barbara Zucker School of Medicine at Hofstra/Northwell.

Dr. Kane earned his medical degree from New York University in New York, New York, and completed his internship and residency in Psychiatry at The Zucker Hillside Hospital. He is a diplomate of the American Board of Psychiatry and Neurology.

Dr. Kane is the recipient of many awards, including the Lieber Prize, The APA's Kempf Award and Foundations Prize, the New York State Office of Mental Health Lifetime Achievement Award, and the Dean Award from the American College of Psychiatrists. He has served as President of the American Society of Clinical Psychopharmacology, the Psychiatry Research Society and the Schizophrenia International Research Society.

Dr. Kane has been the principal investigator on 23 NIH grants focusing on schizophrenia, psychobiology and treatment, recovery, and improving the quality and cost of care. He is the author of over 900 peer-reviewed papers and serves on the editorial boards of numerous journals.

### **Dr. Hanna:**

Dr. Lauren Hanna is Assistant Professor of Psychiatry at the Donald and Barbara Zucker School of Medicine at Hofstra/Northwell. She is the Director of Global Mental Health for Northwell's Center for Global Health where she is working with Guyana's Ministry of Health to expand national mental health services aimed at suicide prevention. She is Associate Program Director and Director of Antiracism & Social Justice for the Zucker Hillside Hospital Psychiatry Residency Program. In these roles, she oversees the integration of social justice, antiracism, and anti-oppression principles into the didactic curriculum, training the next generation of psychiatrists to be socially-conscious in their work with diverse patient populations.

She supervises residents in the Early Treatment Program and OnTrackNY as part of a multidisciplinary, specialized team with expertise in the treatment of early episode psychosis. Additionally, she is a repetitive transcranial magnetic stimulation (rTMS) practitioner for the Bioelectronic Medicine for Neuropsychiatric Disorders (BioMEND) clinical research center and has a tele-psychotherapy private practice.

# Schizophrenia Treatment: Clozapine, LAIs, Technology and Equity with John Kane, MD and Lauren Hanna, MD

*Jason Wong, BA, Joseph Flaxer, MD, MPH, Julia Tartaglia, MD, David Puder, MD*

## Dr. Tartaglia

Julia Tartaglia, M.D. is a PGY-4 psychiatry resident at Zucker Hillside Hospital/Northwell Health. Dr. Tartaglia is passionate about digital psychiatry. She is conducting research on mental health mobile app interventions, social media use, and mental health. At Northwell, she is part of the Zucker Hillside Hospital Digital Psychiatry Program steering committee and founded the Digipsych interest group. She has been a member of the APA App Advisor committee since 2019 and a part of the MHIT committee since 2022. This year she also co-chaired the APA Annual Meeting technology subcommittee.

## Dr. Flaxer:

Joseph Flaxer, M.D., MPH, is a PGY4 psychiatry resident at Zucker Hillside Hospital/Northwell Health. Dr. Flaxer's main focuses are community psychiatry, social justice work, family therapy, and he plans to pursue a fellowship in child & adolescent psychiatry. He is on the leadership board of the resident run antiracism organization RISE (dismantling Racial Injustice and promoting Systemic Equity). He is one of the resident psychiatrists in the Early Treatment Program and OnTrackNY programs for treatment of early episode psychosis. His prior public health research was focused on integrated behavioral healthcare for patients with SMI and on historical parallels between opioid and medical cannabis popularization.

## References:

Abshire, Cathy M.Ed., John Kane, M.D., Tamara G. Sale, M.A., Lisa Dixon, M.D., M.P.H. An Overview of Coordinated Specialty Care (CSC) for Persons with First Episode Psychosis | National Association of State Mental Health Program Directors. Accessed August 20, 2023.

Addington, Jean Ph.D., Robert K. Heinszen, Ph.D., Delbert G. Robinson, M.D., Duration of Untreated Psychosis in Community Treatment Settings in the United States | Psychiatric Services. Accessed August 20, 2023.



# Schizophrenia Treatment: Clozapine, LAIs, Technology and Equity with John Kane, MD and Lauren Hanna, MD

Jason Wong, BA, Joseph Flaxer, MD, MPH, Julia Tartaglia, MD, David Puder, MD

Anglin DM, Ereshefsky S, Klaunig MJ, et al. From Womb to Neighborhood: A Racial Analysis of Social Determinants of Psychosis in the United States. *Am J Psychiatry*. 2021;178(7):599-610.

Arnovitz MD, Spitzberg AJ, Davani AJ, et al. MDMA for the Treatment of Negative Symptoms in Schizophrenia. *J Clin Med*. 2022;11(12):3255.

Birnbaum ML, Norel R, Van Meter A, et al. Identifying signals associated with psychiatric illness utilizing language and images posted to Facebook. *Npj Schizophr*. 2020;6(1):1-10.

Birnbaum ML, Garrett C, Baumel A, et al. Using Digital Media Advertising in Early Psychosis Intervention. *Psychiatr Serv Wash DC*. 2017;68(11):1144-1149.

Birnbaum ML, Garrett C, Baumel A, et al. Digital Strategies to Accelerate Help-Seeking in Youth With Psychiatric Concerns in New York State. *Front Psychiatry*. 2022;13. Accessed August 20, 2023.

Birnbaum ML, Wen H, Meter AV, et al. Identifying emerging mental illness utilizing search engine activity: A feasibility study. *PLOS ONE*. 2020;15(10):e0240820.

Chaudri NA. Adherence to Long-term Therapies Evidence for Action. *Ann Saudi Med*. 2004;24(3):221-222.

Demjaha A, Lappin JM, Stahl D, et al. Antipsychotic treatment resistance in first-episode psychosis: prevalence, subtypes and predictors. *Psychol Med*. 2017;47(11):1981-1989.

Hänsel K, Lin IW, Sobolev M, et al. Utilizing Instagram Data to Identify Usage Patterns Associated With Schizophrenia Spectrum Disorders. *Front Psychiatry*. 2021;12. Accessed August 20, 2023.

Hardy, Kenneth V Racial Trauma: Clinical Strategies and Techniques for Healing Invisible Wounds.: 9781324030430: Amazon.com: Books. Accessed August 20, 2023.

Hardy KV, Bobes T, eds. *Culturally Sensitive Supervision and Training: Diverse Perspectives and Practical Applications*. 1st edition. Routledge; 2016.

Idänpään-Heikkilä J, Alhava E, Olkinuora M, Palva I. Letter: Clozapine and agranulocytosis. *Lancet Lond Engl*. 1975;2(7935):611.

# Schizophrenia Treatment: Clozapine, LAIs, Technology and Equity with John Kane, MD and Lauren Hanna, MD

Jason Wong, BA, Joseph Flaxer, MD, MPH, Julia Tartaglia, MD, David Puder, MD

Kahn RS, Winter van Rossum I, Leucht S, et al. Amisulpride and olanzapine followed by open-label treatment with clozapine in first-episode schizophrenia and schizophreniform disorder (OPTiMiSE): a three-phase switching study. *Lancet Psychiatry*. 2018;5(10):797-807.

Kanahara N, Yamanaka H, Suzuki T, Takase M, Iyo M. First-episode psychosis in treatment-resistant schizophrenia: a cross-sectional study of a long-term follow-up cohort. *BMC Psychiatry*. 2018;18(1):274.

Kane J, Honigfeld G, Singer J, Meltzer H. Clozapine for the treatment-resistant schizophrenic. A double-blind comparison with chlorpromazine. *Arch Gen Psychiatry*. 1988;45(9):789-796.

Kane JM, Schooler NR, Marcy P, et al. Effect of Long-Acting Injectable Antipsychotics vs Usual Care on Time to First Hospitalization in Early-Phase Schizophrenia: A Randomized Clinical Trial. *JAMA Psychiatry*. 2020;77(12):1217-1224. doi:10.1001/jamapsychiatry.2020.2076.

King DR, Emerson MR, Tartaglia J, Nanda G, Tatro NA. Methods for Navigating the Mobile Mental Health App Landscape for Clinical Use. *Curr Treat Options Psychiatry*. Published online May 24, 2023:1-15.

Kirschenbaum MA, Birnbaum ML, Rizvi A, Muscat W, Patel L, Kane JM. Google search activity in early psychosis: A qualitative analysis of internet search query content in first episode psychosis. *Early Interv Psychiatry*. 2020;14(5):606-612. doi:10.1111/eip.12886.

Knudson-Martin C, McDowell T, Bermudez JM. From Knowing to Doing: Guidelines for Socioculturally Attuned Family Therapy. *J Marital Fam Ther*. 2019;45(1):47-60.

Lally J, Ajnakina O, Di Forti M, et al. Two distinct patterns of treatment resistance: clinical predictors of treatment resistance in first-episode schizophrenia spectrum psychoses. *Psychol Med*. 2016;46(15):3231-3240.

Masuda T, Misawa F, Takase M, Kane JM, Correll CU. Association With Hospitalization and All-Cause Discontinuation Among Patients With Schizophrenia on Clozapine vs Other Oral Second-Generation Antipsychotics: A Systematic Review and Meta-analysis of Cohort Studies. *JAMA Psychiatry*. 2019;76(10):1052-1062.

# Schizophrenia Treatment: Clozapine, LAIs, Technology and Equity with John Kane, MD and Lauren Hanna, MD

Jason Wong, BA, Joseph Flaxer, MD, MPH, Julia Tartaglia, MD, David Puder, MD

McCutcheon R, Beck K, D'Ambrosio E, et al. Antipsychotic plasma levels in the assessment of poor treatment response in schizophrenia. *Acta Psychiatr Scand*. 2018;137(1):39-46.

Mozilla Foundation. Top Mental Health & Prayer Apps Fail at Privacy, Security. Published May 2, 2022. Accessed August 20, 2023.

Najibi, Alex SITNFlash. Racial Discrimination in Face Recognition Technology. Science in the News. Published October 24, 2020. Accessed August 20, 2023.

Petrides G, Malur C, Braga RJ, et al. Electroconvulsive therapy augmentation in clozapine-resistant schizophrenia: a prospective, randomized study. *Am J Psychiatry*. 2015;172(1):52-58.

Schwartz RC, Blankenship DM. Racial disparities in psychotic disorder diagnosis: A review of empirical literature. *World J Psychiatry*. 2014;4(4):133-140.

Stroup TS, Gerhard T, Crystal S, Huang C, Olfson M. Geographic and clinical variation in clozapine use in the United States. *Psychiatr Serv Wash DC*. 2014;65(2):186-192.

Taipale H, Tanskanen A, Mehtälä J, Vattulainen P, Correll CU, Tiihonen J. 20-year follow-up study of physical morbidity and mortality in relationship to antipsychotic treatment in a nationwide cohort of 62,250 patients with schizophrenia (FIN20). *World Psychiatry*. 2020;19(1):61-68.

Torous J, Kiang MV, Lorme J, Onnela JP. New Tools for New Research in Psychiatry: A Scalable and Customizable Platform to Empower Data Driven Smartphone Research. *JMIR Ment Health*. 2016;3(2):e16. doi:10.2196/mental.5165.

Warner R. Does the scientific evidence support the recovery model? *The Psychiatrist*. 2010;34(1):3-5.

Watts-Jones TD. Location of self: opening the door to dialogue on intersectionality in the therapy process. *Fam Process*. 2010;49(3):405-420.

Wiśniewski H, Gorrindo T, Rauseo-Ricupero N, Hilty D, Torous J. The Role of Digital Navigators in Promoting Clinical Care and Technology Integration into Practice. *Digit Biomark*. 2020;4(Suppl 1):119-135.