VNIVERSITAT DE VALÈNCIA Facultat de Fisioteràpia

PROGRAMA DE DOCTORADO EN FISIOTERAPIA

ESTUDIO SOBRE SOFTWARE DE GESTIÓN, PRÁCTICAS Y NECESIDADES DE LOS FISIOTERAPEUTAS

TESIS DOCTORAL

Presentada por:

Eduard Arza Moncunill

Dirigida por:

Dr. Rodrigo Martín De San Agustín

Dr. Francesc Medina i Mirapeix

Valencia, Abril de 2024.

VNIVERSITAT DE VALÈNCIA Facultat de Fisioteràpia

PROGRAMA DE DOCTORADO EN FISIOTERAPIA

ESTUDIO SOBRE SOFTWARE DE GESTIÓN, PRÁCTICAS Y NECESIDADES DE LOS FISIOTERAPEUTAS

TESIS DOCTORAL

Presentada por:

Eduard Arza Moncunill

Dirigida por:

Dr. Rodrigo Martín De San Agustín

Dr. Francesc Medina i Mirapeix

Valencia, Abril de 2024.

D. Rodrigo Martín De San Agustín, Doctor por la *Universitat de València* y Ayudante Doctor en la *Universitat de València*

D. Francesc Medina Mirapeix, Doctor por la Universidad de Murcia y Catedrático de Universidad del área de Fisioterapia en la Universidad de Murcia.

CERTIFICAN que la presente memoria, titulada "**ESTUDIO SOBRE SOFTWARE DE GESTIÓN, PRÁCTICAS Y NECESIDADES DE LOS FISIOTERAPEUTAS**", corresponde al trabajo realizado bajo su dirección por D. Eduard Arza Moncunill, para su presentación como Tesis Doctoral en el Programa de Doctorado en Fisioterapia de la Universitat de València, y consideramos que reúne las condiciones apropiadas en cuanto a contenidos y rigor científico para ser presentado a trámite de lectura.

Y para que conste, firman la presente certificación en Valencia, a 13 de Abril de 2024.

RODRIGO MARTIN DE SAN AGUSTIN - NIF:71703334Y

Firmado digitalmente por RODRIGO MARTIN DE SAN AGUSTIN - NIF:71703334Y
DN: CN=RODRIGO MARTIN DE SAN AGUSTIN - NIF:71703334Y, SERIALNUMBER=71703334Y, G=RODRIGO, SN=MARTIN DE SAN AGUSTIN, OU=CIUDADANOS, O=ACCV, C=ES
Razón: Soy el autor de este documento
Ubicación:
Fecha: 2024.04.13 12:03:23+02'00'
Foxit PDF Reader Versión: 2024.1.0

Fdo.: Rodrigo Martín De San Agustín
Director

MEDINA MIRAPEIX FRANCISCO - 52690364D

Firmado digitalmente por MEDINA MIRAPEIX FRANCISCO - 52690364D
Fecha: 2024.04.13 12:34:35 +02'00'

Fdo.: Francesc Medina Mirapeix
Director

Ratificación del tutor con su firma:

RODRIGO MARTIN DE SAN AGUSTIN - NIF:71703334Y

Firmado digitalmente por RODRIGO MARTIN DE SAN AGUSTIN - NIF:71703334Y
DN: CN=RODRIGO MARTIN DE SAN AGUSTIN - NIF:71703334Y, SERIALNUMBER=71703334Y, G=RODRIGO, SN=MARTIN DE SAN AGUSTIN, OU=CIUDADANOS, O=ACCV, C=ES
Razón: Soy el autor de este documento
Ubicación:
Fecha: 2024.04.13 12:03:36+02'00'
Foxit PDF Reader Versión: 2024.1.0

Fdo.: Rodrigo Martín De San Agustín
Tutor/a

Agradecimientos:

A Rodrigo Martín De San Agustín, por su extensa dedicación, implicación y paciencia en este largo proceso de investigación, por ser un gran apoyo y contacto durante todo este tiempo, y por compartir su experiencia y vivencias a lo largo de todo el doctorado.

A Francesc Medina Mirapeix, por su valiosa aportación en la dirección de la tesis con sus conocimientos y experiencia; por su dedicación e implicación personal en el proyecto; y por su paciencia, insistencia, integridad y recursos facilitados para mi aprendizaje.

A Jesús Ramírez Castillo por su ayuda, apoyo e interés durante toda la investigación.

A José Casaña Granell por su aportación y apoyo al inicio del proyecto.

Al ICOFCV por toda la ayuda prestada para la realización y difusión de la investigación realizada en esta tesis.

A todos los voluntarios que se prestaron para los grupos focales, encuestas y cuestionarios, por su aportación.

A mis padres y familia por la educación y la formación recibida, por el apoyo incondicional, etc. En especial a mi madre, un gran apoyo a quien echo mucho de menos.

A mi mujer Mireia, por animarme a realizar y completar mi objetivo, por el apoyo y la escucha durante la realización de mi investigación. Y a mis hijos por alegrarme la vida.

A mis amigos por estar ahí, y compartir momentos de desahogo y desconexión.

Índice

Índice de abreviaturas

CINAHL: Cumulative Index of Nursing and Allied Health Literature

COVID-19: Enfermedad por coronavirus de 2019

CP: Calidad Percibida

DHI: Digital Health Interventions (Intervenciones Digitales de Salud)

HCD: Historia Clínica Digital

HCE: Historia Clínica Electrónica

IBECS: Índice Bibliográfico Español en Ciencias de la Salud

ICOFCV: Ilustre Colegio Oficial de Fisioterapeutas de la Comunidad Valenciana

LILACS: Literatura Latinoamericana y del Caribe en Ciencias de la Salud

ONU: Organización de las Naciones Unidas

OMS: Organización Mundial de la Salud

PEDro: Physiotherapy Evidence Database

QQPPMS: Quality Questionnaire on Physiotherapy Practice Management Software

SGC: Software de Gestión de Clínicas

SNS: Sistema Nacional de Salud

SPSS: Statistical Package for the Social Sciences

TIC: Tecnologías de la información y la comunicación.

UE: Unión Europea

WCPT: World Confederation for Physical Therapy

Índice

Resumen de la tesis

1. Introducción

La constante evolución de las tecnologías de la información y la comunicación (TIC) han provocado numerosos cambios en nuestra sociedad, evolucionando hacia la digitalización de prácticamente todos los ámbitos de nuestra vida diaria (operaciones bancarias, gestiones con la administración pública, pago de tributos, compras por internet, reservas, citas, entradas, billetes, etc.). También, en el ámbito sanitario se han producido cambios progresivos como pedir citas online o consultar nuestro historial de salud.

Hace ya años que numerosas instituciones como la Organización de las Naciones Unidas (Carnicero, J., 2012), la Organización Mundial de la Salud (OMS) (World Health Organization, 2020; World Health Organization. Regional Office for Europe, 2018) o la Unión Europea (UE) (Directorate-General for Health and Food Safety, European Commission, 2012) reconocieron el valor de las tecnologías digitales en la asistencia sanitaria y se marcaron el objetivo de digitalizar los sistemas nacionales de salud para conseguir la cobertura sanitaria universal y otros objetivos de sostenibilidad (World Health Organization, 2020). En la región europea de la OMS, el 87% de los países en 2022 disponían ya de un sistema nacional o regional interconectado de historia clínica digital (World Health Organization, 2023). En España, todas las comunidades autónomas han incorporado las TIC para la digitalización de la asistencia sanitaria, y tienen sistemas de Historia Clínica Digital (HCD) en fase de implementación casi completa en atención primaria y sensiblemente por debajo en la atención especializada (Instituto de Información Sanitaria, Agencia de Calidad del Sistema Nacional de Salud, 2020).

La digitalización de los sistemas de salud se ha extendido rápidamente en los últimos años, y esta tendencia se ha acelerado por la pandemia de COVID-19 (WHO Regional Office for Europe, 2022). Los sistemas digitales de salud son muy importantes para conseguir la accesibilidad, la transmisión y la comunicación de la información; permiten mejorar la calidad y seguridad de la prestación de la asistencia sanitaria (p.ej. reduce los errores por comprensión, previene errores por alergias o reacciones adversas); mejoran la coordinación y la eficiencia de los sistemas sanitarios; y facilitan el empoderamiento del paciente (Carnicero, J., 2012; Gagnon et al., 2009; Nguyen,

Bellucci, & Nguyen, 2014; World Health Organization. Regional Office for Europe, 2018). Asimismo, pueden permitir la estandarización del lenguaje, la evaluación de la asistencia, la medición de indicadores de calidad y seguridad, la obtención y utilización de estadísticas (para la formación, la investigación, la salud pública, las políticas sanitarias y otros objetivos de salud), el apoyo a la toma de decisiones y la flexibilidad en el trabajo (Carnicero, J., 2012; Peterson, Hamilton, & Hasvold, 2016; World Health Organization. Regional Office for Europe, 2018).

Ante este movimiento imparable hacia la digitalización, y en consonancia con las iniciativas de la ONU, la UE, la OMS o el Sistema Nacional de Salud (SNS), la Fisioterapia como profesión sanitaria no puede mantenerse ajena a las nuevas exigencias de la sociedad. En Fisioterapia, las TIC más extendidas son los Software de Gestión de Clínicas (SGC), programas que están diseñados para ayudar a los profesionales sanitarios a gestionar los aspectos administrativos y operativos de sus consultas como la programación de citas, la gestión de historiales de pacientes, la elaboración de informes, o la facturación y el procesamiento de pagos (Hannah Whiteoak, 2023).

En la primera década de los años 2000 los SGC de Fisioterapia se centraban en los aspectos de gestión del negocio como la administración de citas, facturación y contabilidad (Canadian Physiotherapy Association, Physiotherapy Association of British Columbia., 2016). Más recientemente, estos sistemas se han adaptado a la captura electrónica de datos clínicos porque ofrece muchas ventajas con respecto a los registros en papel (recuperación más fácil de la información, mejor legibilidad, ahorro de espacio, informes automáticos) (Canadian Physiotherapy Association, Physiotherapy Association of British Columbia., 2016). Reconociendo la creciente demanda en Fisioterapia, los proveedores han ido adaptando sus SGC para incluir la funcionalidad de la Historia Clínica Electrónica (HCE) (Canadian Physiotherapy Association, Physiotherapy Association of British Columbia., 2016), convirtiéndose en la oferta principal de la mayoría de los SGC actuales (Australian Physiotherapy Association (APA), 2018). La HCE permite documentar, almacenar y recuperar electrónicamente la información sanitaria de los pacientes (World Health Organization. Regional Office for Europe, 2018).

Asimismo, los SGC eran diseñados anteriormente para ordenadores que se utilizaban en una única ubicación (Grand View Research, 2022). Hoy en día, las soluciones en la nube han transformado el sector al ofrecer flexibilidad para operar desde dispositivos móviles (Grand View Research, 2022). Además, ha habido un auge de otros programas y funcionalidades complementarias (por ejemplo: aplicaciones de e-salud, aplicaciones para comunicarse, prescripción de ejercicios, telerehabilitación), que se han ido integrando progresivamente para completar las funcionalidades de los SGC (Australian Physiotherapy Association (APA), 2018). Por tanto, un SGC de Fisioterapia es sólo una parte de un ecosistema de información y comunicación más amplio, donde cada vez más profesionales de la salud y clientes utilizan sistemas digitales, y donde necesitamos dar respuesta a las iniciativas en un contexto global como la HCD del SNS y la digitalización de los sistemas sanitarios (Australian Physiotherapy Association (APA), 2018). Así pues, necesitamos software que interoperen con otros sistemas y programas.

Según la bibliografía, la adopción e implementación de estas tecnologías digitales en las clínicas de Fisioterapia se asocia a beneficios como la mejora de la documentación, facilitar el flujo de trabajo de la clínica, la mejora de la comunicación entre los miembros del equipo, la mejora de la eficiencia en el funcionamiento de la clínica, la mejora de la calidad y la seguridad de la atención, la fácil recuperación de datos, la capacidad para elaborar informes, la mejora en la toma de decisiones, la capacidad para futuras investigaciones o el ahorro de costes (American Physical Therapy Association, 2016; Buyl & Nyssen, 2008; M. Merolli, Gray, Choo, Lawford, & Hinman, 2022; Michel-Verkerke, 2015; Vreeman, Taggard, Rhine, & Worrell, 2006). El uso estratégico de SGC en Fisioterapia puede ser de gran ayuda para fisioterapeutas y pacientes, facilitando una gestión más eficiente que permitiría a los profesionales dedicar más tiempo a la atención de los pacientes, y a los pacientes su empoderamiento.

Por estos motivos, el sector de los software en la asistencia sanitaria y las clínicas de Fisioterapia está creciendo en los últimos años (Australian Physiotherapy Association (APA), 2018). El tamaño del mercado mundial de software de Fisioterapia se valoró en 1,09 billones de dólares en 2021 y se estima que crecerá a una tasa de crecimiento anual compuesta del 10,1 % durante 2023-2030 hasta los 2,52 billones de dólares en 2030 (Grand View Research, 2022). América del Norte dominó el mercado de software de

Fisioterapia con una cuota de más del 52% en 2021 (Grand View Research, 2022). Sin embargo, a pesar de la tendencia hacia la digitalización de la sanidad y los beneficios potenciales, la adopción de estas tecnologías en las clínicas de Fisioterapia ha sido baja y lenta en el tiempo (American Physical Therapy Association, 2016; Buyl & Nyssen, 2008; Keel, Schmid, Keller, & Schoeb, 2022; M. Merolli et al., 2022; Michel-Verkerke, 2015; Postolache, Oliveira, & Postolache, 2017; Vreeman et al., 2006; Yung, 2017).

Así, por ejemplo, en 2016, solo el 28% de los fisioterapeutas de Estados Unidos utilizaba un sistema electrónico, el 33% utilizaba un sistema que combinaba papel y electrónico, y el 38% no utilizaba ningún sistema electrónico de los 6700 fisioterapeutas que respondieron a la encuesta (American Physical Therapy Association, 2016). En Canadá, en una encuesta entre 461 fisioterapeutas en British Columbia realizada en 2015, sólo el 19% de clínicas registraban electrónicamente la historia clínica, mientras que el 81% todavía lo hacía en papel (Canadian Physiotherapy Association, Physiotherapy Association of British Columbia., 2016). En Bélgica, de 18355 fisioterapeutas activos en el primer lustro del siglo XXI, sólo entre el 30-50% de fisioterapeutas almacenaban sus datos electrónicamente según el Colegio Nacional de Fisioterapeutas, asimismo se pueden encontrar datos similares en otros países europeos (Buyl & Nyssen, 2008). Mientras que en Australia y Nueva Zelanda, alrededor del 60% de los fisioterapeutas (56% y 68%) en dos encuestas recientes, utilizaban sólo un formato electrónico para registrar la historia clínica en su práctica diaria (Chen, 2018; M. Merolli et al., 2022).

En general, los problemas más comunes manifestados con los sistemas electrónicos diseñados para el ámbito clínico son los bajos índices de adopción (Al Ani et al., 2022; Clarke, Watt, Sheard, Wright, & Adamson, 2017; Hailey, Yu, & Munyisia, 2014; Kruse, Kristof, Jones, Mitchell, & Martinez, 2016; Williams, Shah, Leider, & Gupta, 2017). En diversos estudios donde se han investigado los factores que influyen en ello, han identificado la poca consideración por la funcionalidad y facilidad de uso al diseñar los sistemas (Busse et al., 2023; Lowry et al., 2012; Ludwick & Doucette, 2009). Como soluciones, involucrar a los usuarios en todas las etapas del proceso de diseño era mencionado como la mejor solución para el diseño y desarrollo de un sistema basado en el usuario, porque mejora la funcionalidad y calidad del diseño, adaptándose a las

necesidades de los usuarios y mejorando su aceptación (Busse et al., 2023; Chandran, Al-Sa'di, & Ahmad, 2020; Lowry et al., 2012). Es necesario que el SGC se adapte a las necesidades de información, flujo de trabajo y práctica de los profesionales sanitarios (Hailey et al., 2014; Häyrinen, Saranto, & Nykänen, 2008).

Más concretamente en Fisioterapia, se han identificado las barreras para la implantación de las TIC en Fisioterapia como un rendimiento del software poco satisfactorio o inadecuado, no atender a las necesidades prácticas y reales de los usuarios, la falta de conocimiento por parte de los desarrolladores del programa sobre los procesos y flujos de trabajo en Fisioterapia, falta de cooperación entre fisioterapeutas y desarrolladores, o la formación del personal (Postolache, Moreira, Pedro, & Oliveira, 2015; Vreeman et al., 2006). Por tanto, se sugiere la necesidad de un mejor modelo teórico para el diseño e implantación de las TIC (Postolache et al., 2017).

Las principales recomendaciones destinadas al diseño y desarrollo de software para Fisioterapia, se centran en incluir el análisis del flujo de trabajo, y la participación activa de los usuarios en las actividades de diseño y desarrollo del software para identificar sus necesidades e incorporar su perspectiva (Postolache et al., 2017; Vreeman et al., 2006). En cuanto a la implementación, se han propuesto múltiples recomendaciones como la planificación previa y adecuada antes de la implementación, la estandarización de datos, la formación adecuada del personal y consideraciones sobre los posibles cambios requeridos en la clínica (American Physical Therapy Association, 2016; Canadian Physiotherapy Association, Physiotherapy Association of British Columbia., 2016; Messer-Misak & Egger, 2016; Vreeman et al., 2006).

La participación activa de los fisioterapeutas en las actividades de diseño y desarrollo del software, se prevé que identifique los atributos específicos del SGC, requeridos por los fisioterapeutas, para un uso práctico y funcional, que minimice el impacto en el flujo de trabajo de las clínicas. La adaptación a las necesidades de los fisioterapeutas mejoraría el diseño del software y debería satisfacer sus expectativas, para evitar la insatisfacción con su uso (Vreeman et al., 2006). La expectativa es una creencia de que un objeto posee o debería poseer un atributo determinado (Cardello, 2007).

El cumplimiento de las expectativas es un constructo abstracto basado en la discrepancia entre expectativas y percepciones, que ha sido descrito previamente (Zeithaml, Berry, & Parasuraman, 1988) y medido en múltiples contextos (Głuchowski, Czarniecka-Skubina, Kostyra, Wasiak-Zys, & Bylinka, 2021; Mensah, Damoah, & Aidoo, 2012; Verdú Jover, Lloréns Montes, & Fuentes Fuentes, 2004). Suele denominarse también calidad percibida (CP) (Verdú Jover et al., 2004), y su medición se basa en cuestionarios que incluyen tanto las expectativas como las percepciones de múltiples atributos (Medina-Mirapeix, del Baño-Aledo, Martínez-Payá, Lillo-Navarro, & Escolar-Reina, 2015). La importancia de medir la CP se justifica porque si las expectativas son mayores que las percepciones, se produce un disentimiento de las expectativas, la CP es baja y por tanto, se produce la insatisfacción del cliente (Parasuraman, Zeithaml, & Berry, 1994).

A pesar de todo esto, la investigación sobre las necesidades, expectativas y CP de los fisioterapeutas con respecto a los SGC, identificadas a partir de la participación de éstos en las actividades de diseño y desarrollo, son limitadas. Ciertos estudios se centran en las perspectivas de los pacientes y fisioterapeutas sobre las TIC (Mark Merolli, Hinman, Lawford, Choo, & Gray, 2021; Postolache et al., 2017), los factores que influyen en el uso práctico durante el proceso terapéutico y las competencias necesarias para su uso (Messer-Misak & Egger, 2016), o las actitudes y opiniones sobre beneficios y barreras para su adopción (Rausch et al., 2021; Reynolds, Awan, & Gallagher, 2021).

Conscientes del creciente interés de los fisioterapeutas por las TIC, las asociaciones profesionales de Fisioterapia han venido orientando a sus miembros en el proceso de planificación y adopción de SGC (American Physical Therapy Association, 2016; Australian Physiotherapy Association (APA), 2018; Canadian Physiotherapy Association, Physiotherapy Association of British Columbia., 2016; Chartered Society of Chartered Physiotherapists, UK, 2020). Sin embargo, estas guías o consejos se basan en la experiencia vivida en otras profesiones, o entrevistas y opiniones de fisioterapeutas y expertos. Hasta donde sabemos, no se han realizado grupos focales para tratar las necesidades específicas de los fisioterapeutas sobre un SGC para su práctica profesional en el día a día, ni tampoco existe ningún cuestionario validado para explorar las expectativas y percepciones de los fisioterapeutas sobre los SGC.

1.1 Objetivos

Los objetivos generales de la tesis son:

- Conocer las necesidades de los fisioterapeutas con respecto al uso de SGC.
- Desarrollar y validar un cuestionario para medir las expectativas de los fisioterapeutas respecto a los SGC.
- Desarrollar y validar un cuestionario para medir la CP de los fisioterapeutas respecto a los SGC.
- Describir las expectativas y CP de los fisioterapeutas respecto a los SGC.

2. Metodología

Para este estudio se eligió una estrategia de investigación con métodos mixtos. El trabajo constó de un estudio cualitativo y cuantitativo en varias fases, realizadas consecutivamente y referidas entre sí. Los SGC de Fisioterapia son productos de ingeniería complejos, cuyo concepto y diseño se espera que sea multidimensional.

2.1. Diseño, procedimiento y sujetos

El estudio se diseñó en 3 fases. 1) Elaboración del marco teórico actual de los SGC a partir de la búsqueda, revisión sistemática de la bibliografía y estudio de las características de los SGC actuales. 2) Grupos focales con fisioterapeutas para conocer los atributos requeridos por los fisioterapeutas con respecto a un SGC. 3) Diseño y validación del cuestionario sobre las expectativas y la CP de los fisioterapeutas sobre dichos atributos.

2.1.1 Elaboración del marco teórico

Esta fase se realizó en 2 etapas.

a) Búsqueda y revisión bibliográfica.

Se identificaron los términos específicos y las palabras clave para realizar una revisión sistemática en diferentes bases de datos (Cochrane, Pubmed, Google Académico, CINAHL, Scopus, Web of Science, IBECS, LILACS, PEDro), distintos repositorios de tesis y tesinas (ej. Teseo, Dialnet); además de consultar diferentes fuentes electrónicas y portales de interés como la OMS, la Comisión Europea, la World Confederation of Physical Therapy (WCPT), y distintos colegios profesionales internacionales que permitieron localizar varios artículos y guías de interés. Se tuvieron en cuenta las diferentes denominaciones en español y en inglés, se utilizaron truncamientos y operadores boleanos para cubrir todas las posibilidades y filtros para acotar las búsquedas. Se revisaron las referencias bibliográficas, las citas de los estudios y las revisiones principales en busca de referencias adicionales. Una vez localizados e identificados los estudios más relevantes, se procedió a la lectura crítica y a la obtención de información relevante sobre el estado actual de este tema.

b) Identificación de características y uso de los software.

Por un lado, se contactó con la WCPT y numerosos colegios profesionales internacionales para averiguar los software más empleados en sus respectivos países y cualquier información relevante al respecto (Ver Anexo 1 de Colegios Internacionales consultados). A raíz de estas consultas se identificaron diversos programas de gestión y se localizaron guías de recomendaciones sobre la elección e implementación de programas de gestión para clínicas. Como resultado de estas consultas se estudiaron las características y prestaciones de 15 software de gestión en Fisioterapia.

Por otro lado, y dado que el ámbito de la investigación era la Comunitat Valenciana, se contactó con el Ilustre Colegio Oficial de Fisioterapeutas de la Comunidad Valenciana (ICOFCV) para identificar si sus colegiados usaban programas de gestión. Una encuesta interna del citado colegio puso de manifiesto que al menos un 50% de los fisioterapeutas que respondieron, usaban algún tipo de software. Esto permitió identificar y estudiar los software más utilizados.

El estudio de los diferentes software de gestión se realizó mediante la consulta de las páginas web correspondientes para conocer las características y servicios que ofrecían, realización de pruebas con la demo o versión gratuita, consulta de videotutoriales y blogs, lectura del manual de usuarios y condiciones de contrato, o consultas con las empresas para aclarar dudas. El análisis de los software de gestión más relevantes, identificados con la búsqueda nacional e internacional, junto con los aspectos más destacados identificados durante la revisión bibliográfica, permitieron la elaboración de un marco teórico de referencia que contribuyó a conocer la situación actual de los programas de gestión en Fisioterapia, y sirvió para diseñar la estructura, guion y preguntas de los grupos focales.

2.1.2 Realización de grupos focales

El diseño cualitativo de este estudio incluyó grupos focales porque la interacción grupal proporciona una gama más amplia de respuestas que podrían no surgir de las entrevistas individuales (Bonilla-Jimenez & Escobar, 2017; Hennink, 2013). Los grupos focales se han utilizado en estudios anteriores, cómo por ejemplo para conocer las

percepciones de los médicos sobre la historia clínica electrónica (Alawi, Dhaheri, Baloushi, Dhaheri, & Prinsloo, 2014; Witry, Doucette, Daly, Levy, & Chrischilles, 2010).

Dada la escasez de investigaciones sobre los atributos específicos de un SGC requeridos por los fisioterapeutas, este estudio utilizó un enfoque construccionista para construir una comprensión y un conocimiento (Corbin & Strauss, 2014) basado en las percepciones de los fisioterapeutas, sobre el uso práctico de SGC incluyendo en los grupos focales fisioterapeutas con conocimientos clínicos, de gestión y experiencia en SGC para servicios de Fisioterapia. El enfoque seleccionado se consideró el más adecuado para la pregunta de investigación (Bogdan & Biklen, 1998; Corbin & Strauss, 2014; Miles & Huberman, 1994).

Se elaboró un guion con una introducción para poner en antecedentes a los participantes sobre el estudio, los objetivos de la investigación y de los grupos focales. Y se diseñó una guía temática para introducir los diferentes campos y exponer las preguntas planteadas (ver Anexo 2). Se realizaron ajustes en el protocolo y las preguntas de los grupos focales en función de la experiencia inicial y la información facilitada por los participantes.

Para la selección de los participantes, se utilizó una estrategia de muestreo intencional para identificar principalmente perfiles de fisioterapeutas con experiencia clínica y de gestión, con alguna experiencia en el manejo de software de gestión. También se buscó la diversidad de perfiles con fisioterapeutas que trabajan en diferentes especialidades (pediatría, neurología, deportivo, musculo-esquelético, suelo pélvico…), en diferentes sectores (privado, público, seguros y mutuas, en el extranjero…), con diferentes responsabilidades (propietarios/gerentes, empleados, autónomos) para aportar una visión y perspectiva diferentes.

Los investigadores contactaron inicialmente por teléfono con 42 candidatos para explicarles el proyecto y averiguar su disponibilidad. Se informó exhaustivamente a los participantes sobre el contenido del estudio y los beneficios asociados a la investigación. Se enviaron el documento informativo del estudio (en el que se explicaban los detalles del proyecto de investigación) y los consentimientos para que los leyeran íntegramente. Y se invitó a los candidatos al grupo de discusión correspondiente.

Primero, se realizó un grupo focal preliminar para evaluar la idoneidad del guion, con la participación de un ingeniero informático y un médico de familia (entre otros) con conocimientos en la materia, para aportar su perspectiva y experiencia. Segundo, con el guion modificado, se realizaron 6 grupos focales con un total de 27 participantes, y la participación de un moderador y un asistente. El primer Grupo Focal se realizó de forma presencial en la sede del ICOFCV en Castellón el sábado 11 de enero de 2020, mientras que los 5 grupos focales restantes se realizaron por videoconferencia con el programa *GoToMeeting* el 5, 13, 19, 26 de junio y 4 de julio, debido a las restricciones existentes por la pandemia de coronavirus. Cada grupo focal incluía de tres a seis participantes y duraba entre 90 y 120 minutos.

El desarrollo de las fases de selección y los motivos de la no participación, así como las características demográficas de los participantes se presentan en el Artículo I. Cuando un candidato cancelaba o no acudía a su cita, se hacía lo posible por reprogramarlo en otros grupos. Se solicitaron los consentimientos informados de todos los participantes para su participación en el estudio y para la toma de imágenes. No se recogieron datos sanitarios ni especialmente sensibles, y no se recibió ninguna compensación por la participación. Todos los grupos focales se grabaron en vídeo y audio para su posterior transcripción y análisis. Los participantes tenían una media de 18,7 años de experiencia clínica, la gran mayoría eran propietarios/directores de centros de Fisioterapia y predominaba ampliamente el sector privado (80%), un sector que predomina en la situación de la Fisioterapia actual (Instituto Nacional de Estadística, 2023; Ministerio de Sanidad, 2022; Plaza Casares S., 2023). Seguidamente, se procedió a la transcripción de los grupos focales con el programa *Speechnotes*. Los datos recogidos fueron tratados de forma anónima, de modo que ni los participantes ni sus respuestas pudieran ser identificados, asignando códigos numéricos a los participantes.

Fruto de esta fase, se identificaron 43 ítems o atributos (22 en el área de atención clínica y 21 en el área de actividades administrativas) agrupados en 12 subtemas, 5 temas y 2 grandes áreas temáticas: atención clínica y tareas administrativas.

2.1.3 Proceso de desarrollo y validación del cuestionario de las expectativas y CP de los fisioterapeutas sobre SGC

La información obtenida de la elaboración del marco teórico y los grupos focales, permitió la elaboración de un cuestionario para examinar qué expectativas y CP tenían los fisioterapeutas en relación a los atributos identificados. Para la construcción del cuestionario se siguieron todas las fases de construcción para conseguir una herramienta de medición válida y fiable (Miles & Huberman, 1994; Sarabia Cobo & Alconero Camarero, 2019; Saturno PJ, 2008). En las siguientes secciones se describen el desarrollo y la medición de la escala propuesta, así como los distintos pasos implicados.

a) Desarrollo de ítems y pretest cognitivo

El objetivo de esta etapa era construir preguntas basadas en los atributos identificados anteriormente. De los 43 atributos identificados en los grupos focales se desarrollaron 43 pares de ítems, cada uno se plasmó en dos enunciados: uno para medir las expectativas que genera el SGC y otro para medir las percepciones de los fisioterapeutas sobre su SGC actual.

En las expectativas, cada área incluía una pregunta general redactada en los siguientes términos: "El software deseable para su centro debería permitir (los siguientes atributos) ...". En cuanto a las percepciones, cada área incluía una pregunta general redactada en los siguientes términos: "El software que utiliza actualmente en su centro permite (los siguientes atributos) ...". Se utilizó una escala Likert de 7 puntos para las respuestas, que iba desde "muy en desacuerdo" hasta "muy de acuerdo". Este diseño permitió calcular las puntuaciones de diferencia mediante la fórmula CP=Expectativas menos percepciones, donde CP es inversamente proporcional, es decir, valores más altos de CP significan menor calidad percibida.

El cuestionario se sometió a una prueba previa para comprobar la comprensión de las instrucciones y de las preguntas del cuestionario, valorar la dificultad y extensión del cuestionario, y la adecuación y validez del contenido con 11 fisioterapeutas en 2 grupos focales. Se reformularon cuatro preguntas porque daban lugar a malentendidos. El instrumento finalmente distribuido para su evaluación constaba de 43 pares de ítems (22 en el área de atención clínica y 21 en el área de actividades administrativas).

b) Pilotaje del cuestionario

Se realizó una encuesta al conjunto de los fisioterapeutas colegiados en la Comunidad Valenciana, mediante la cumplimentación del cuestionario online en *LimeSurvey*. El enlace al cuestionario fue distribuido por el ICOFCV a todos los fisioterapeutas colegiados vía correo electrónico y publicado en sus redes sociales corporativas con las explicaciones pertinentes. Los participantes elegibles eran todos los fisioterapeutas titulados para conocer sus expectativas y sus percepciones con respecto a SGC. Se enviaron recordatorios a los 1 y 3 meses después, a través del ICOFCV e individualmente utilizando el listado público de clínicas registradas por el ICOFCV y el Registro General de Centros, Servicios y Establecimientos Sanitarios del Ministerio de Sanidad, Bienestar y Consumo. Las respuestas fueron totalmente anónimas y se estableció una cookie para evitar participaciones repetidas.

2.2. Análisis de los datos

Se realizaron múltiples análisis de los datos recopilados tanto en el estudio con grupos focales como en relación al estudio de pilotaje del cuestionario con ítems de expectativas y percepciones de los fisioterapeutas sobre SGC.

En el estudio con grupos focales, se utilizó un enfoque de análisis temático para codificar y clasificar los comentarios en los distintos temas, subtemas y categorías; y luego se recopilaron en dos áreas centrales de contenido: atributos para mejorar el flujo de trabajo en la atención clínica y tareas administrativas.

Los investigadores llevaron a cabo un proceso iterativo de lectura, análisis y codificación de los datos, utilizando programas informáticos de tratamiento de textos para codificar las categorías. Éstas se agruparon en conceptos similares para formar subtemas y temas. Los investigadores revisaron y compararon sus conclusiones para llegar a un consenso a lo largo del proceso. La categorización y clasificación de cada afirmación codificada fue sistemáticamente revisada, discutida y validada por consenso por el equipo de investigación.

En el estudio de pilotaje del cuestionario, el análisis se realizó en tres fases: las dos primeras para la validación de las expectativas y de la CP, y la última para su descripción. Las características sociodemográficas y clínicas de los participantes se

describieron mediante estadísticos descriptivos. Todos los análisis se realizaron con el programa SPSS 28.0 (SPSS Inc., Chicago, IL, EE.UU.).

En la primera fase, en relación con las expectativas, se realizaron una serie de análisis para evaluar la reducción secuencial de ítems, la estructura factorial del cuestionario y las propiedades métricas de las escalas multi-ítem divididas en cada una de las dos áreas (atención clínica y actividades administrativas). Primero, se eliminaron los pares de ítems en los que el ítem de expectativas se comprendía mal (>10% sin respuesta) (DeVellis & Thorpe, 2021), los que mostraban escasa variabilidad (desviación típica <0.60) (Medina-Mirapeix et al., 2015), o escasa correlación con otros ítems del mismo dominio conceptual en cada una de las áreas de atención clínica y actividades administrativas (carga factorial <0,40 en un factor o >0,40 en más de un factor) (Ware & Gandek, 1998). Así, se eliminaron un total de 17 pares de ítems (ver Artículo II).

Segundo, en un análisis de matriz multimétodo-multirasgo, se utilizó una matriz de correlaciones de todos los ítems de cada área y escala para comprobar en qué medida los ítems convergen con las escalas y divergen de ellas. Para puntuar las escalas se utilizó un método de promedios, sumando las puntuaciones de cada ítem de la escala correspondiente y dividiéndolas por el número de ítems de esa escala. Se calcularon las correlaciones entre cada ítem y su escala hipotética y se corrigieron los solapamientos, no incluyéndolos en la escala. Para cada escala, se calcularon los porcentajes de acierto en la clasificación como el porcentaje de ítems dentro de la escala que se correlacionaban más o significativamente más con la escala hipotética, que con las demás. Un ítem correlacionaba significativamente más con su propia escala si la correlación entre el ítem y su escala hipotetizada era más de 2 errores estándar superior a su correlación con otras escalas (Parasuraman et al., 1994). Además, se calculó el coeficiente alfa de Cronbach para comprobar la fiabilidad de la consistencia interna de cada escala, considerándose aceptable un valor >0,7 y excelente >0.9.

En la segunda fase, dirigida a la validación de la CP, fueron considerados exclusivamente los pares de ítems cuya expectativa fue considerada válida en la anterior fase. El análisis de este cuestionario pasó el mismo proceso de reducción secuencial de ítems, de estructura factorial del cuestionario y las propiedades métricas de las escalas multi-ítem. En este análisis, el área de contabilidad se consideró un área diferente del

área de actividades administrativas, puesto que sólo respondieron los fisioterapeutas con experiencia en este campo. Así se eliminaron 2 ítems más.

A su vez, la validación del constructo se evaluó utilizando la validez de grupo conocida y definiendo 2 grupos: un subgrupo de participantes que evaluaron la percepción global de la calidad de su software actual como "buena" o "muy buena" y otro subgrupo que la evaluó como "muy mala", "mala" o "regular". Nuestra hipótesis era que las puntuaciones de CP (es decir, expectativas menos percepciones) de todas las escalas serían más bajas en los participantes con evaluaciones altas de la percepción global de la calidad que en los que tenían una percepción global de la calidad pobre. Se utilizó una prueba *t* de Student para comprobar si había diferencias en las puntuaciones medias de las escalas entre estos 2 grupos. También se compararon las puntuaciones medias de las respuestas al cuestionario entre hombres y mujeres con una prueba *t* de Student para muestras independientes. Nuestra hipótesis era que no habría diferencias significativas en las puntuaciones medias de los dos grupos.

En la tercera fase, dirigida a la descripción de las puntuaciones de las expectativas y de la CP en relación a cada atributo, se crearon gráficos de caja. En relación a las expectativas, también se calcularon los porcentajes de fisioterapeutas que esperaban la presencia de todos los ítems de una escala y los que no esperaban ninguno y se utilizó la prueba *t* de Student para comparar los porcentajes entre fisioterapeutas con o sin experiencia con el SGC.

3. Resultados

La revisión bibliográfica y el estudio de SGC identificados en las consultas con colegios profesionales nacionales e internacionales, permitieron la elaboración de un marco teórico de referencia sobre la situación actual de los programas de gestión en Fisioterapia, y sirvió para diseñar la estructura, guion y preguntas de los grupos focales. Posteriormente, se realizaron y analizaron los grupos focales para conocer las necesidades del colectivo. En los grupos focales se identificaron 43 categorías de términos codificados divididos en 12 subtemas y cinco temas generales, que se recopilaron en dos áreas centrales de contenido: atención clínica y tareas administrativas.

En el área de atención clínica, surgieron dos temas (registro de datos y emisión de informes sobre la atención clínica de los pacientes; y comunicación electrónica de la atención clínica con los pacientes y otros profesionales sanitarios) y seis subtemas (plantillas, herramientas digitalizadas y códigos de clasificación para el registro de datos; herramientas digitalizadas y plantillas para la emisión de informes individualizados de los pacientes; medidas digitalizadas para supervisar la calidad de la atención; recordatorios automatizados para pacientes y profesionales dentro de la agenda de programación; intervenciones digitales de salud ; portal del paciente).

En el área de actividades administrativas surgieron tres temas (gestión de documentos administrativos y comunicaciones de marketing; facturación y contabilidad de pagos y suministros; acceso al SGC) y seis subtemas (emisión automatizada de documentos rutinarios; herramientas de comunicación para estrategias de marketing; facturación flexible y contabilidad automatizada de pagos; contabilidad automatizada de suministros para controlar las existencias; interoperabilidad; herramientas de seguridad de datos para hacer frente a fallos, usos inadecuados y amenazas).

Tras las fases 1 y 2 se diseñó un cuestionario inicial con 43 pares de ítems para validar dichas necesidades y conocer las expectativas y percepciones de los fisioterapeutas sobre dichas necesidades con respecto a los SGC. Un total de 272 y 144 fisioterapeutas respondieron a las preguntas sobre expectativas y percepciones respectivamente. Entre los 144, sólo 95 realizaban tareas de contabilidad y contestaron

a las percepciones sobre Facturación y Contabilidad. Las características demográficas de los participantes están descritas en las tablas de los respectivos artículos.

De los 43 ítems sobre expectativas que formaron parte del cuestionario inicial, tras el pilotaje con los 272 fisioterapeutas, permanecieron 12 ítems en cuatro escalas en el área de atención clínica y 14 ítems agrupados en cinco escalas en el área de actividades administrativas. Esos 26 ítems constituyeron el cuestionario final denominado ‘‘Expectations of Physiotherapists Questionnaire on Practice Management Software’’ (EPQPMS) (ver Artículo II).

De los 26 pares de ítems inicialmente considerados para la validación del cuestionario de CP, tras el pilotaje con los 144 fisioterapeutas que respondieron a las preguntas sobre expectativas y percepciones, permanecieron un total de 24 ítems de CP sobre SGC, repartidos en 9 escalas y 3 áreas de contenido (atención clínica, tareas administrativas y contabilidad). El cuestionario se denominó Quality Questionnaire on Physiotherapy Practice Management Software (QQPPMS). El contenido y el número de dominios del QQPPMS fue muy similar al cuestionario inicial. Sólo 2 dominios no se integraron en el cuestionario final (coordinación del flujo de trabajo e interoperabilidad), mientras que 2 dominios se fusionaron en 1 (registro de datos y emisión de informes) (Ver Artículo III y Anexo 3). Por lo tanto, parece que nuestra selección secuencial de ítems fue muy eficiente.

El área de atención clínica consta de 11 pares de ítems agrupados en 4 escalas (registro de datos y emisión de informes, portal del paciente, intervenciones digitales de salud, control de la calidad de la asistencia). El área de tareas administrativas incluye 9 pares de ítems agrupados en 3 escalas (emisión de documentos rutinarios, estrategias de marketing, seguridad de los datos). Finalmente, el área de contabilidad consta de 4 pares de ítems agrupados en 2 escalas (facturación y contabilidad, control del stock de fungibles).

El cuestionario demostró ser fiable y válido. En el análisis multi-rasgo de escalas, todas las puntuaciones presentaron fuertes correlaciones ítem-escala, un excelente éxito en la clasificación de los ítems y una buena consistencia interna (coeficientes alfa de Cronbach > 0,7). La validez de constructo confirmó que aquellos participantes que

tenían una percepción global alta de la calidad de su SGC puntuaban mejor en la CP para cada una de las escalas, que aquellos que tenían una percepción global baja de la calidad, excepto para el “portal del paciente” e “intervenciones digitales de salud”. Estas dos escalas obtuvieron puntuaciones similares entre los grupos.

En relación con la descripción de las expectativas que tienen los fisioterapeutas sobre qué atributos debería tener un SGC, nuestro estudio muestra que las expectativas actuales eran altas en la mayoría de los ítems, y que muchos fisioterapeutas mostraban expectativas en todos los ítems de cada escala. En la mayoría de los ítems, al menos el 50% de los participantes informaron de algún nivel de expectativas (es decir, puntuaciones 4 o de acuerdo) y al menos un 25% mostró la puntuación más alta de 7 (máximo nivel de acuerdo). Al menos el 75% de los fisioterapeutas esperaban encontrar en el SGC todos los ítems de cuatro de las escalas del área de actividades administrativas y de "registro de datos y emisión de informes" en el área de atención clínica. Mientras que sólo dos escalas concentraron la mayoría de los atributos con menos expectativas, el 18% de los fisioterapeutas no esperaban encontrar ningún ítem de "control de la calidad de la asistencia'' y el 35,5% ningún ítem de “intervenciones digitales de salud''. En este estudio participaron fisioterapeutas con y sin experiencia con SGC, y se mostró que ambos grupos tenían un patrón similar de expectativas con los ítems del cuestionario.

En cuanto los resultados de CP (diferencia entre las expectativas y las percepciones), por una parte, los resultados obtenidos para las expectativas fueron elevados (media de 5,83) en la mayoría de las escalas de las 3 áreas de contenido (solo en las “intervenciones digitales de salud” resultaron más bajas de 5,30 sobre 7), mientras que las percepciones (media de 3,78) para las escalas en el área de atención clínica eran más bajas (valores por debajo de 3,30) que el resto de escalas (por encima de 3.72 excepto “control del stock de fungibles”). Esto significa que la CP en el área de atención clínica y en la escala de “control del stock de fungibles” eran mayores (es decir, CP pobres) que en la mayoría del resto de escalas (4 de las escalas restantes puntuaron por debajo de 1.98).

En este sentido, en el 81% de los atributos del área de atención clínica, la mitad de los fisioterapeutas puntuaron CP > 2,5, mientras que en las otras dos áreas, esto sólo

ocurrió en los atributos de "control del stock de fungibles". Así, en el 55% de los atributos restantes, la mitad de los fisioterapeutas puntuaron CP ≤ 0. Estos resultados indicarían que el apoyo de los SGC para las tareas clínicas asistenciales y el “control del stock de fungibles”, provoca insatisfacción entre los fisioterapeutas.

4. Conclusiones

1. El presente estudio permitió identificar 43 atributos considerados relevantes por los fisioterapeutas para satisfacer sus necesidades en el uso práctico de SGC. Esos atributos se agrupan en 2 temas relacionados con el apoyo a la atención clínica (registro de datos y emisión de informes sobre la atención clínica de los pacientes; comunicación electrónica de la atención clínica con los pacientes y otros profesionales sanitarios) y 3 temas relacionados con el apoyo a actividades administrativas (gestión de documentos administrativos y comunicaciones de marketing; facturación y contabilidad de pagos y suministros; acceso al SGC).

2. El EPQPMS es un cuestionario que incluye 26 ítems distribuidos en 9 escalas, que ha demostrado ser válido y fiable para medir las expectativas de los fisioterapeutas con respecto al uso de los SGC para la atención clínica y las actividades administrativas.

3. El QQPMS es un cuestionario que incluye 24 ítems distribuidos en 9 escalas, que ha demostrado ser válido y fiable para medir la CP sobre los SGC que actualmente usan los fisioterapeutas para apoyar su atención clínica, las actividades administrativas y la contabilidad.

4. La mayoría de los fisioterapeutas tenían altas expectativas en todos los ítems de cada escala, especialmente en los relativos a las actividades administrativas y "registro de datos y emisión de informes" en la atención clínica, independientemente de que tuvieran o no experiencia en SGC. Una proporción considerable de fisioterapeutas tenía expectativas muy bajas en los ítems relacionados con las ``intervenciones digitales de salud'' y en menor medida en los ítems relacionados con el “control de la calidad de la asistencia”

5. Un alto porcentaje de fisioterapeutas indicaron que la CP de sus SGC es muy satisfactoria con respecto a sus prestaciones de apoyo a las actividades administrativas, y poco satisfactoria con respecto al apoyo a la atención clínica y el "control del stock de fungibles". Estos dos últimos aspectos deberían mejorarse en los actuales SGC de Fisioterapia.

5. Bibliografía

Al Ani, M., Garas, G., Hollingshead, J., Cheetham, D., Athanasiou, T., & Patel, V. (2022). Which Electronic Health Record System Should We Use? A Systematic Review. *Medical Principles and Practice*, *31*(4), 342-351. doi: 10.1159/000525135

Alawi, S. A., Dhaheri, A. A., Baloushi, D. A., Dhaheri, M. A., & Prinsloo, E. A. M. (2014). Physician user satisfaction with an electronic medical records system in primary healthcare centres in Al Ain: A qualitative study. *BMJ Open*, *4*(11), e005569. doi: 10.1136/bmjopen-2014-005569

American Physical Therapy Association. (2016). *Understanding and adopting electronic health records (EHR)*.

Australian Physiotherapy Association (APA). (2018). *Practice Management Software insight 2018*.

Bogdan, R. C., & Biklen, S. K. (1998). *Qualitative Research in Education. An Introduction to Theory and Methods. Third Edition.* Allyn & Bacon, A Viacom Company, 160 Gould St., Needham Heights, MA 02194; Internet: www.abacon.com ($63). Recuperado de https://eric.ed.gov/?id=ed419813

Bonilla-Jimenez, F. I., & Escobar, J. (2017). *Grupos focales: Una guía conceptual y metodológica*. Recuperado de http://148.202.167.116:8080/xmlui/handle/123456789/957

Busse, T. S., Jux, C., Laser, J., Rasche, P., Vollmar, H. C., Ehlers, J. P., & Kernebeck, S. (2023). Involving Health Care Professionals in the Development of Electronic Health Records: Scoping Review. *JMIR Human Factors*, *10*(1), e45598. doi: 10.2196/45598

Buyl, R., & Nyssen, M. (2008). From a paper-based to an electronic registry in physiotherapy. *Collaborative Patient Centred eHealth*, 75-81. doi: 10.3233/978-1-58603-922-6-75

Canadian Physiotherapy Association, Physiotherapy Association of British Columbia. (2016). *PABC EMR Toolkit: Implementing electronic medical records in private practice physiotherapy settings.*

Cardello, A. V. (2007). Measuring consumer expectations to improve food product development. *Consumer-Led Food Product Development*, 223-261.

Carnicero, J. (2012). *Manual de salud electrónica para directivos de servicios y sistemas de salud*. Recuperado de https://hdl.handle.net/11362/3023

Chandran, S., Al-Sa'di, A., & Ahmad, E. (2020). Exploring User Centered Design in Healthcare: A Literature Review. *2020 4th International Symposium on Multidisciplinary Studies and Innovative Technologies (ISMSIT)*, 1-8. doi: 10.1109/ISMSIT50672.2020.9255313

Chartered Society of Chartered Physiotherapists, UK. (2020, abril 23). Moving to paperlight records. Recuperado 14 de noviembre de 2023, de The Chartered Society of Physiotherapy website: https://www.csp.org.uk/professional-clinical/digital-physiotherapy/moving-paperlight-records

Chen, C.-W. (2018). *The perspectives of physiotherapists in Canterbury on the use of electronic health records.* doi: 10.26021/9634

Clarke, A., Watt, I., Sheard, L., Wright, J., & Adamson, J. (2017). Implementing electronic records in NHS secondary care organizations in England: Policy and progress since 1998. *British Medical Bulletin*, *121*(1), 95-106. doi: 10.1093/bmb/ldw055

Corbin, J., & Strauss, A. (2014). *Basics of Qualitative Research: Techniques and Procedures for Developing Grounded Theory*. SAGE Publications.

DeVellis, R. F., & Thorpe, C. T. (2021). *Scale Development: Theory and Applications*. SAGE Publications.

Directorate-General for Health and Food Safety, European Commission. (2012). eHealth Action Plan 2012-2020. Recuperado 6 de octubre de 2023, de https://health.ec.europa.eu/publications/ehealth-action-plan-2012-2020_en

Gagnon, M.-P., Légaré, F., Labrecque, M., Frémont, P., Pluye, P., Gagnon, J., … Gravel, K. (2009). Interventions for promoting information and communication technologies adoption in healthcare professionals. *Cochrane Database of Systematic Reviews*, (1). doi: 10.1002/14651858.CD006093.pub2

Głuchowski, A., Czarniecka-Skubina, E., Kostyra, E., Wasiak-Zys, G., & Bylinka, K. (2021). Sensory Features, Liking and Emotions of Consumers towards Classical, Molecular and Note by Note Foods. *Foods*, *10*(1), 133. doi: 10.3390/foods10010133

Grand View Research. (2022). Physical Therapy Software Market Analysis Report, 2022-2030. Recuperado 6 de octubre de 2023, de https://www.grandviewresearch.com/industry-analysis/physical-therapy-software-market-report

Hailey, D., Yu, P., & Munyisia, E. (2014). Pre-implementation investigation of the readiness of allied health professionals to adopt electronic health records. En *Investing in E-Health: People, Knowledge and Technology for a Healthy Future* (pp. 47-53). IOS Press. doi: 10.3233/978-1-61499-427-5-47

Hannah Whiteoak. (2023). What Is Practice Management Software? Recuperado 10 de noviembre de 2023, de https://www.softwareadvice.com/resources/what-is-practice-management-software/

Häyrinen, K., Saranto, K., & Nykänen, P. (2008). Definition, structure, content, use and impacts of electronic health records: A review of the research literature. *International Journal of Medical Informatics*, *77*(5), 291-304. doi: 10.1016/j.ijmedinf.2007.09.001

Hennink, M. M. (2013). *Focus Group Discussions*. Oxford University Press.

Instituto de Información Sanitaria, Agencia de Calidad del Sistema Nacional de Salud. (2020). El Sistema de Historia Clínica Digital del SNS. Recuperado 2 de abril de 2024, de https://www.sanidad.gob.es/areas/saludDigital/historiaClinicaSNS/antecedentesHCDSNS.htm

Instituto Nacional de Estadística. (2023). Fisioterapeutas colegiados por año y sexo. Recuperado 14 de marzo de 2024, de INE website: https://www.ine.es/jaxi/Datos.htm?tpx=30727

Keel, S., Schmid, A., Keller, F., & Schoeb, V. (2022). Investigating the use of digital health tools in physiotherapy: Facilitators and barriers. *Physiotherapy Theory and Practice*, 1-20. doi: 10.1080/09593985.2022.2042439

Kruse, C. S., Kristof, C., Jones, B., Mitchell, E., & Martinez, A. (2016). Barriers to Electronic Health Record Adoption: A Systematic Literature Review. *Journal of Medical Systems*, *40*(12), 252. doi: 10.1007/s10916-016-0628-9

Lowry, S. Z., Quinn, M. T., Ramaiah, M., Schumacher, R. M., Patterson, E. S., North, R., … Abbott, P. (2012). (NISTIR 7804) Technical Evaluation, Testing and Validation of

the Usability of Electronic Health Records. *NIST*. Recuperado de https://www.nist.gov/publications/nistir-7804-technical-evaluation-testing-and-validation-usability-electronic-health

Ludwick, D. A., & Doucette, J. (2009). Adopting electronic medical records in primary care: Lessons learned from health information systems implementation experience in seven countries. *International Journal of Medical Informatics*, *78*(1), 22-31. doi: 10.1016/j.ijmedinf.2008.06.005

Medina-Mirapeix, F., del Baño-Aledo, M. E., Martínez-Payá, J. J., Lillo-Navarro, M. C., & Escolar-Reina, P. (2015). Development and validity of the questionnaire of patients' experiences in postacute outpatient physical therapy settings. *Physical Therapy*, *95*(5), 767-777.

Mensah, O., Damoah, O., & Aidoo, R. (2012). Assessing Farmers' Satisfaction of Agronomic Services Received in Ghana Using the SERVQUAL Model-a Case Study of Kumasi Metropolis. *International Journal of Business and Social Science*, *3*(19).

Merolli, M., Gray, K., Choo, D., Lawford, B. J., & Hinman, R. S. (2022). Use, and acceptability, of digital health technologies in musculoskeletal physical therapy: A survey of physical therapists and patients. *Musculoskeletal Care*, *20*(3), 641-659. doi: 10.1002/msc.1627

Merolli, Mark, Hinman, R. S., Lawford, B. J., Choo, D., & Gray, K. (2021). Digital Health Interventions in Physiotherapy: Development of Client and Health Care Provider Survey Instruments. *JMIR Research Protocols*, *10*(7), e25177. doi: 10.2196/25177

Messer-Misak, K., & Egger, R. (2016). Specific Requirements of Physiotherapists on the Practical Use of Software in the Therapeutical Process. *Health Informatics Meets eHealth*, 158-166. doi: 10.3233/978-1-61499-645-3-158

Michel-Verkerke, M. B. (2015). The Love-hate Relationship of Physical Therapists with Electronic Patient Records. *Procedia Computer Science*, *64*, 432-441. doi: 10.1016/j.procs.2015.08.538

Miles, M. B., & Huberman, A. M. (1994). *Qualitative Data Analysis: An Expanded Sourcebook*. SAGE.

Ministerio de Sanidad. (2022). Ministerio de Sanidad—Sanidade en datos—Informe Anual del Sistema Nacional de Salud 2020-21. Recuperado 2 de abril de 2024, de http://www.mscbs.es/gl////estadEstudios/estadisticas/sisInfSanSNS/tablasEstadisticas/InfSNS2020-21.htm

Nguyen, L., Bellucci, E., & Nguyen, L. T. (2014). Electronic health records implementation: An evaluation of information system impact and contingency factors. *International Journal of Medical Informatics*, *83*(11), 779-796. doi: 10.1016/j.ijmedinf.2014.06.011

Parasuraman, A., Zeithaml, V. A., & Berry, L. L. (1994). Alternative scales for measuring service quality: A comparative assessment based on psychometric and diagnostic criteria. *Journal of Retailing*, *70*(3), 201-230. doi: 10.1016/0022-4359(94)90033-7

Peterson, C. B., Hamilton, C., & Hasvold, P. (2016). *From innovation to implementation: eHealth in the WHO European region*. Copenhagen, Denmark: WHO Regional Office for Europe.

Plaza Casares S. (2023). Un fisioterapeuta por cada 10.000 habitantes: La especialidad olvidada en la sanidad pública. Recuperado 14 de marzo de 2024, de Www.elsaltodiario.com website: https://www.elsaltodiario.com/sanidad-

publica/un-fisioterapeuta-cada-10000-habitantes-especialidad-olvidada-sanidad-publica

Postolache, G., Moreira, I., Pedro, L., & Oliveira, R. (2015). *Implementation of Electronic Health Record Systems in Physical Therapy*. 2.

Postolache, G., Oliveira, R., & Postolache, O. (2017). Designing Digital Tools for Physiotherapy. En A. L. Brooks & E. Brooks (Eds.), *Interactivity, Game Creation, Design, Learning, and Innovation* (pp. 74-88). Cham: Springer International Publishing. doi: 10.1007/978-3-319-55834-9_9

Rausch, A.-K., Baur, H., Reicherzer, L., Wirz, M., Keller, F., Opsommer, E., … Barbero, M. (2021). Physiotherapists' use and perceptions of digital remote physiotherapy during COVID-19 lockdown in Switzerland: An online cross-sectional survey. *Archives of Physiotherapy*, *11*(1), 18. doi: 10.1186/s40945-021-00112-3

Reynolds, A., Awan, N., & Gallagher, P. (2021). Physiotherapists' perspective of telehealth during the Covid-19 pandemic. *International Journal of Medical Informatics*, *156*, 104613. doi: 10.1016/j.ijmedinf.2021.104613

Sarabia Cobo, C. M., & Alconero Camarero, A. R. (2019). Claves para el diseño y validación de cuestionarios en Ciencias de la Salud. *Enfermería en cardiología Nº. 77, 2019, págs. 69-73*. Recuperado de https://repositorio.unican.es/xmlui/handle/10902/26747

Saturno PJ. (2008). *Fases de construcción de una encuesta. Selección de ítems, formulación de preguntas y diseño del cuestionario. Manual del Máster en gestión de la calidad en los servicios de salud. , 2ª Ed. Universidad de Murcia, 2008. ISBN: 978-84-8371-757-8.*

Verdú Jover, A. J., Lloréns Montes, F. J., & Fuentes Fuentes, M. del M. (2004). Measuring perceptions of quality in food products: The case of red wine. *Food Quality and Preference*, *15*(5), 453-469. doi: 10.1016/j.foodqual.2003.08.002

Vreeman, D. J., Taggard, S. L., Rhine, M. D., & Worrell, T. W. (2006). Evidence for Electronic Health Record Systems in Physical Therapy. *Physical Therapy*, *86*(3), 434-446. doi: 10.1093/ptj/86.3.434

Ware, J. E., & Gandek, B. (1998). Methods for Testing Data Quality, Scaling Assumptions, and Reliability: The IQOLA Project Approach. *Journal of Clinical Epidemiology*, *51*(11), 945-952. doi: 10.1016/S0895-4356(98)00085-7

WHO Regional Office for Europe. (2022). Monitoring the implementation of digital health: An overview of selected national and international methodologies. Recuperado 7 de junio de 2023, de https://www.who.int/europe/publications/i/item/WHO-EURO-2022-5985-45750-65816

Williams, K. S., Shah, G. H., Leider, J., & Gupta, A. (2017). Overcoming Barriers to Experience Benefits: A Qualitative Analysis of Electronic Health Records and Health Information Exchange Implementation in Local Health Departments. *eGEMs*, *5*(1), 18. doi: 10.5334/egems.216

Witry, M. J., Doucette, W. R., Daly, J. M., Levy, B. T., & Chrischilles, E. A. (2010). Family Physician Perceptions of Personal Health Records. *Perspectives in Health Information Management / AHIMA, American Health Information Management Association*, *7*(Winter), 1d.

World Health Organization. (2020). Recommendations on digital interventions for health system strengthening. Recuperado 7 de junio de 2023, de https://www.who.int/publications-detail-redirect/9789241550505

World Health Organization. (2023). Digital Health in the WHO European Region: The ongoing journey to commitment and transformation. Recuperado 3 de octubre de 2023, de https://www.who.int/europe/publications/m/item/digital-health-in-the-who-european-region-the-ongoing-journey-to-commitment-and-transformation

World Health Organization. Regional Office for Europe. (2018). *Towards a roadmap for the digitalization of national health systems in Europe: Expert meeting: Semmelweis University, Budapest, Hungary, 21 June 2018* (N.º WHO/EURO:2018-3325-43084-60302). World Health Organization. Regional Office for Europe. Recuperado de World Health Organization. Regional Office for Europe website: https://apps.who.int/iris/handle/10665/345716

Yung, A. (2017). Adoption of Electronic Health Record System in Community-Based Physiotherapy Clinics: A Pilot Case Study. *Building Capacity for Health Informatics in the Future*, 395-400. doi: 10.3233/978-1-61499-742-9-395

Zeithaml, V. A., Berry, L. L., & Parasuraman, A. (1988). Communication and Control Processes in the Delivery of Service Quality. *Journal of Marketing*, *52*(2), 35-48. doi: 10.2307/1251263

Anexos

Anexo 1- Consultas con colegios internacionales de fisioterapeutas

COLEGIOS PROFESIONALES INTERNACIONALES	RESPUESTA	ESPECIFICACIONES
Alemania- Deutscher Verband fuer Physiotherapie	Sin respuesta	
Argentina- Asociacion Argentina de Kinesiologia	Sin respuesta	
Australia- Australian Physiotherapy Association	Auditoría de softwares. Los más completos: Coreplus, MedTech Evolution and Manage my Health, PPMP, Powerdiary, PrimaryClinic.	
Bélgica- Axxon, Physical Therapy in Belgium	Crossuite KineO http://www.crossuite.com/kinesitherapie, Fysionotes http://www.fysionotes.be/, Geskiné https://www.corilus.be/ , KineQuick http://www.q-top.be/ , KinPlus https://www.corilus.be/ , Oxygen http://www.compufit.be/nl/	Disponen de sistema de certificación de softwares
Canadá- Canadian Physiotherapy Association	Guía de selección de softwares y Auditoría. Softwares auditados: Clinicmaster, ClinicServer, Cliniko, Jane App, Practice Perfect, Global Office.	
Chile- Colegio de Kinesiólogos de Chile	Sin respuesta	
Denmark- Association of Danish Physiotherapists	La asociación no avala ningún software, pero muchos socios utilizan CGM	No dispone de versión en inglés
Estados Unidos- American Physical Therapy Association	Guía para comprender y adoptar software. En el momento de la consulta no podían recomendar ningún software concreto.	APTA Connect, creado gracias a la colaboración de la APTA con Cedaron Medical Inc, EEUU. Empresa seleccionada tras un riguroso proceso de evaluación.

Finlandia-Finnish Association of Physiotherapists	KANTA Services es la historia clínica electrónica en la que los profesionales sanitarios, tanto públicos como privados, comparten la información de la historia clínica por ley. Software privados, Diarium y Acute	Disponen de sistema de certificación de softwares No dispone de versión en inglés
Francia- French Federation of Physiotherapists	Sin respuesta	
Holanda- Koninklijk Nederlands Genootschap Voor Fysiotherapie	Intramed. Además disponen de una auditoría de software pero no está disponible en inglés.	No dispone de versión en inglés
Irlanda- Irish Society of Chartered Physiotherapists	No disponen de esa información sobre softwares privados. Propuesta de encuesta entre colegiados.	
Israel- Israeli Association of Physiotherapists	Sin respuesta	
Noruega- Norwegian Physiotherapy Association	No puede ayudar con software concretos.	
Nueva Zelanda- New Zealand Physiotherapy	Sin respuesta	
Reino Unido- Chartered Society of Physiotherapists	Guía de "Record Keeping Guidance". Software sugeridos: TM3, Jane App, PPS/Rushcliff, PAL Advisors	
Singapur- Singapore Physiotherapy Association	HCE en el sector público, no integra facturación o prescripción de ejercicios. No tienen datos de softwares privados. Propuesta de encuesta entre los colegiados	
Sud-África- South African Society of Physiotherapy	Sin respuesta	
Swedish Association of Physiotherapists	No disponen de ningún sistema que integre todas las actividades diarias.	
Uruguay- Asociación de Fisioterapeutas del Uruguay	Sin respuesta	
World Confederation of Physical Therapists	No tienen información disponible al respecto	

Anexo 2- Preguntas de los grupos focales

Fecha:

Localización:

Grupo Focal Nº:

Preguntas de Apertura

- ¿Qué ineficiencias encuentra en su SGC para la atención clínica?
- ¿Qué soluciones podrían ayudar a resolver estas ineficiencias?
- ¿Qué ineficiencias encuentra en su SGC para las tareas administrativas?
- ¿Qué soluciones podrían ayudar a resolver estas ineficiencias?
- ¿Qué funciones echa de menos en su software actual?

Preguntas de reserva

- ¿Qué funcionalidades y herramientas necesitaríamos para realizar nuestro trabajo de forma más eficiente y mejor?
- ¿Qué herramientas necesitamos en un software para nuestro trabajo clínico diario?
- ¿Utilizáis plantillas para los registros clínicos (fisiograma, anamnesis, exploración física, plan de tratamiento, cuestionarios)?
- ¿Dónde almacenáis los historiales, informes, pruebas complementarias, etc?
- ¿Utilizáis medidas de control de calidad y seguridad de la atención clínica? ¿Cómo medís los resultados de vuestras intervenciones o la satisfacción de los pacientes?
- ¿Qué grado de participación tienen vuestros pacientes en su rehabilitación? ¿Cómo podemos fomentar una mayor implicación en el cuidado de la salud y fortalecer las relaciones con los pacientes?
- ¿Cómo podemos ayudar a la toma de decisiones clínicas?
- ¿Lleváis un seguimiento/control de los materiales utilizados?

- ¿Qué necesidades tenéis a nivel organizativo en vuestros centros de trabajo?
- ¿Cómo podríamos facilitar y agilizar los procesos administrativos?
- ¿Cómo gestionáis las finanzas del negocio?
- ¿Qué sistemas de comunicación utilizáis para interactuar con los pacientes y con otros profesionales de salud?
- ¿Cómo garantizaríais la seguridad y confidencialidad de los datos personales e información sanitaria?
- ¿Qué normativas deben cumplir los centros sanitarios? ¿Qué herramientas facilitarían su cumplimiento?
- ¿Qué soluciones informáticas podrían facilitar y agilizar nuestro trabajo?
- ¿Qué funcionalidades de vuestro programa actual encontráis más útiles? y ¿Qué funcionalidades echáis en falta en vuestros sistemas actuales?

Preguntas de cierre

- ¿Qué barreras encontráis para la implantación de un nuevo programa en vuestro trabajo?
- ¿Qué factores consideráis importantes para poder implantar un nuevo software con éxito en vuestro trabajo?

Anexo 3- Quality Questionnaire on Physiotherapy Practice Management Software" (QQPPMS)

"Quality Questionnaire on Physiotherapy Practice Management Software" (QQPPMS)

EXPECTATIVAS SOBRE LAS PRESTACIONES QUE DEBERÍA OFRECER EL SOFTWARE DESEABLE PARA SU CENTRO

Marque SU GRADO de ACUERDO/DESACUERDO según considere deseable o no cada una de las siguientes prestaciones.

Atención clínica

EL SOFTWARE DESEABLE PARA SU CENTRO DEBERÍA PERMITIR:

1 Acceder a plantillas que definan la anamnesis y exploración a pacientes con patologías concretas

2 Acceder a plantillas de mapas corporales (u otras herramientas similares) que puedan utilizarse al explorar a un paciente

3 Acceder a plantillas de ejercicios terapéuticos (o pautas) para seleccionar y personalizar un programa a su paciente.

4 Acceder a cuestionarios (por ejemplo, EVA, NDI, DASH, SF-36) que pueden utilizarse para medir la funcionalidad de un paciente

5 Acceda a plantillas editables para emitir informes (por ejemplo, clínico-legales, mutuas) a las empresas/clientes que lo soliciten

6 Que sus pacientes puedan reservar online una cita

7 Que sus pacientes puedan consultar online las fechas de las visitas pendientes o realizadas

8 Realizar videollamadas con pacientes u otros profesionales

9 Chatear con uno o más pacientes en tiempo real

10 Generar periódicamente informes de la actividad asistencial prestada en el centro (p.ej. número de pacientes por patologías, nº de sesiones)

11 Generar periódicamente informes de la calidad asistencial prestada en el centro (p.ej. resultados de encuestas de satisfacción)

Actividades administrativas

EL SOFTWARE DESEABLE PARA SU CENTRO DEBERÍA PERMITIR:

12 Acceder a plantillas de facturación o justificantes para emitir a empresas/clientes que lo solicitan

13 Emitir fácilmente facturas, justificantes u otros documentos comunes

14 Que el personal del centro y los pacientes puedan firmar documentos, consentimientos u otras autorizaciones (p.ej. mediante Tablet)

15 Realizar guardados y copias de seguridad automáticas

16 Disponer de medidas (p.ej. antivirus, cifrado) frente a amenazas informáticas

17 Configurar los permisos de acceso al software según el perfil de los trabajadores del centro

18 Acceder a mensajes-tipo editables para enviar a pacientes con un fin (p.ej. recordatorio, publicidad)

19 Enviar comunicaciones masivas (p.ej. para publicidad, promociones) a grupos de interés (corredores, por sexo, patología...)

20 Usar aplicaciones externas (p.ej. WhatsApp, Telegram) para enviar mensajes a pacientes

Contabilidad

EL SOFTWARE DESEABLE PARA SU CENTRO DEBERÍA PERMITIR:

21 Introducir todas las tarifas vigentes en el centro

22 Aplicar excepcionalmente tarifas flexibles (p.ej. por un descuento)

23 Generar informes del stock de fungibles del centro (p.ej. disponibles, consumos habituales)

24 Configurar avisos para reponer algún fungible (p.ej. porque su stock es escaso)

PERCEPCIONES SOBRE LAS PRESTACIONES QUE OFRECE EL SOFTWARE ACTUAL DE SU CENTRO

Marque SU GRADO de ACUERDO/DESACUERDO según considere que el software actual de su centro le permite o no cada una de las siguientes prestaciones.

Atención Clínica

EL SOFTWARE QUE USA ACTUALMENTE EN SU CENTRO PERMITE:

1 Acceder a plantillas que definen la anamnesis y exploración a pacientes con patologías concretas

2 Acceder a plantillas de mapas corporales (u otras herramientas similares) que puedan usarse al explorar a un paciente

3 Acceder a plantillas de ejercicios terapéuticos (o pautas) para seleccionar y personalizar un programa a su paciente

4 Acceder a cuestionarios (p.ej. EVA, NDI, DASH, SF-36) que puedan usarse para medir la funcionalidad de un paciente

5 Acceder a plantillas editables para emitir informes (p.ej. clínico-legales, mutuas) a empresas/clientes que lo solicitan

6 Que sus pacientes puedan reservar online una cita

7 Que sus pacientes puedan consultar online las fechas de las visitas pendientes o realizadas

8 Realizar videollamadas con pacientes u otros profesionales

9 Chatear con uno o más pacientes

10 Generar periódicamente informes de la actividad asistencial prestada en el centro (p.ej. número de pacientes por patologías, nº de sesiones)

11 Generar periódicamente informes de la calidad asistencial prestada en el centro (p.ej. resultados de encuestas de satisfacción)

Actividades administrativas

EL SOFTWARE QUE USA ACTUALMENTE EN SU CENTRO PERMITE:

12 Acceder a plantillas de facturación o justificantes para emitir a empresas/clientes que lo solicitan

13 Emitir fácilmente facturas, justificantes u otros documentos habituales

14 Que el personal del centro y los pacientes puedan firmar documentos, consentimientos u otras autorizaciones (p.ej. mediante Tablet)

15 Realizar guardados y copias de seguridad automáticas

16 Disponer de medidas (p.ej. antivirus, cifrado) frente a amenazas informáticas

17 Configurar los perfiles de acceso al software según el perfil de los trabajadores del centro

18 Acceder a mensajes-tipo editables para enviar a pacientes con un fin (p.ej. recordatorio, publicidad)

19 Enviar comunicaciones masivas (p.ej. para publicidad, promociones) a grupos de interés (corredores, por sexo, patología...)

20 Usar aplicaciones externas (p.ej. WhatsApp, Telegram) para enviar mensajes a pacientes

Contabilidad

SI TIENE EXPERIENCIA CON LOS COBROS AL PACIENTE RELLENE ESTA SECCIÓN, DE LO CONTRARIO PASE A LA SIGUIENTE SECCIÓN.

EL SOFTWARE QUE USA ACTUALMENTE EN SU CENTRO PERMITE:

21 Tener integradas todas las tarifas vigentes en el centro

22 Aplicar excepcionalmente tarifas flexibles (p.ej. por un descuento)

23 Generar informes del stock de fungibles del centro (p.ej. disponibles, consumos habituales)

24 Configurar avisos para reponer algún fungible (p.ej. porque su stock es escaso)

Los ítems finales se presentan en este cuadro. El estilo, el formato y las opciones de respuesta no se reproducen aquí. Para la puntuación se utilizó una escala Likert de 7 puntos, que iba de "Muy en desacuerdo" a "Muy de acuerdo".

Anexo 4- Categorización de los artículos presentados en la tesis doctoral

Artículo	Revista	Factor de impacto (según JCR)	Área temática	Ranking	Cuartil
I	Applied Sciences	2.7	Engineering, Multidisciplinary	42/90	Q2
II	PeerJ	2.7	Multidisciplinary Sciences	36/73	Q2
III	International Journal of Medical Informatics	4.9	Health Care Sciences & Services	15/106	Q1

JCR: Journal Citation Reports (2022).

ARTÍCULO I

Arza-Moncunill, E., Martín-San Agustín, R., Moreno-Seguro, N., Escriche-Escuder, A., & Medina-Mirapeix, F. (2024). Attributes Required by Physiotherapists to Increase Adoption and Implementation of Practice Management Software: A Qualitative Study Using Focus Groups. Applied Sciences, 14(5), 1853. https://doi.org/10.3390/app14051853

applied sciences

MDPI

Article

Attributes Required by Physiotherapists to Increase Adoption and Implementation of Practice Management Software: A Qualitative Study Using Focus Groups

Eduardo Arza-Moncunill [1], Rodrigo Martín-San Agustín [1,*], Noemí Moreno-Seguro [2], Adrián Escriche-Escuder [1] and Francesc Medina-Mirapeix [1,3]

[1] Clinimetry and Technological Development in Therapeutic Exercise Research Group (CLIDET), Department of Physiotherapy, University of Valencia, 46010 Valencia, Spain; armone@alumni.uv.es (E.A.-M.); adrian.escriche@uv.es (A.E.-E.); mirapeix@um.es (F.M.-M.)
[2] Department of Physiotherapy, University of Valencia, 46010 Valencia, Spain; noemi.moreno@uv.es
[3] Department of Physiotherapy, University of Murcia, 30100 Murcia, Spain
* Correspondence: rodrigo.martin@uv.es

Abstract: (1) Background: The aim of this study was to identify the practice management software (PMS) attributes required by physiotherapists to improve software design and development in order to increase the adoption and implementation of software and minimize the impact on the workflow of the clinic. (2) Methods: In total, 27 graduated physiotherapists with clinical and management expertise and experience in management software for physiotherapy services participated in six focus groups. Research staff members recorded, transcribed, and analyzed the focus groups, using a thematic analysis to code and classify the comments. (3) Results: A total of 43 categories of coded statements divided into 12 subthemes and five broad themes were identified and compiled in two core areas of content: clinical care and administrative tasks. In order to improve the adoption and implementation of physiotherapy PMS, this research provides experiential knowledge on the inefficiencies perceived by physiotherapists regarding current software programs and the specific attributes to assist practice management and facilitate workflows. The focus group analyses led us to map the multifaceted framework for physiotherapy PMS. (4) Conclusion: These findings provide valuable information as to what aspects are meaningful for the future design and development of physiotherapy PMS, thus providing guidance to both software developers and to end-users when benchmarking software solutions.

Keywords: physiotherapists; attributes practice management software; focus groups

Citation: Arza-Moncunill, E.; Martín-San Agustín, R.; Moreno-Seguro, N.; Escriche-Escuder, A.; Medina-Mirapeix, F. Attributes Required by Physiotherapists to Increase Adoption and Implementation of Practice Management Software: A Qualitative Study Using Focus Groups. *Appl. Sci.* **2024**, *14*, 1853. https://doi.org/10.3390/app14051853

Academic Editors: Arkady Voloshin and Alexander N. Pisarchik

Received: 19 December 2023
Revised: 24 January 2024
Accepted: 22 February 2024
Published: 23 February 2024

1. Introduction

The field of software in healthcare and physiotherapy clinics has been growing quickly in the last ten years [1,2]. The global physiotherapy software market size was valued at USD 1.09 billion in 2021 and is estimated to grow at a compound annual growth rate of 10.1% during 2023–2030 to USD 2.52 billion in 2030. North America dominated the p market with a share of over 52% in 2021 [3]. The two most adopted tools by physiotherapists in their clinics are electronic health records (EHRs) and practice management software (PMS) [1,2]. On the one hand, software for EHRs enables clinicians to document, store, and retrieve electronic patients' healthcare information [4]. On the other hand, PMS was initially more focused on business and administrative operations in the practice clinic, although they have more recently included EHRs among their functionalities. Furthermore, there has been an explosion in other software packages (e.g., eHealth applications, financial systems, and applications to communicate or interoperate with other systems) that often interact/integrate with PMS [2].

According to the literature, the adoption and implementation of these digital technologies in physiotherapy clinics is associated with benefits such as efficiency in the workflow of the clinic, improved communication among members of the team, improved quality and security of care, easy data retrieval, etc. [5,6]. Despite the potential benefits, the adoption of these technologies in physiotherapy clinics is low and slow over time [5–9]. Thus, for example, in Belgium, out of 18,355 active physiotherapists in the first lustrum of the 21st century, only 30–50% of physiotherapists stored their data electronically, according to the National College of Physiotherapists, and similar data can be found in other European countries [7]. In 2015, only 19% of physiotherapy clinics in British Columbia (Canada) were using an electronic medical record, while 81% were still working on paper [1]. In 2016, only 28% of the physiotherapists from the United States of America (USA) were using an electronic system, 33% were using a system combining paper and electronic, and 38% were not using any electronic system at all [10]. Meanwhile, in Australia and New Zealand, around 60% (68.6 and 56%) of physiotherapists in two recent surveys used an electronic format for recording clinical records [11,12]. Low adoption rates are also one of the most common problems reported with electronic systems designed for healthcare [13–17]. An early systematic review in 2006 [5] identified barriers to the implementation of EHRs in physiotherapy (e.g., the inadequacy of software, the challenge of staff training, and modifying the functioning of the practice). Also, the lack of information system developers' knowledge on physiotherapy processes and workflow, not addressing tangible and practical needs, and the lack of cooperation between physiotherapists and ICT developers were indicated as barriers to ICT adoption by physiotherapists [18]. Multiple recommendations, focused on software design and implementation, have been proposed for overcoming these barriers. Regarding implementation, previous and adequate planning before implementation was suggested, including staff training and considerations of potential changes required in the clinic [1,5,10,19]. Aware of these recommendations and barriers, professional physiotherapy associations have been guiding their members in regard to the process of planning and adopting PMS and/or EHRs [1,2,10].

The main recommendations intended for software design focused on including both clinicians and a workflow analysis in the software development activities to incorporate the physiotherapists' perspectives in order to help identify and understand their requirements and processes [5]. The application of these recommendations is expected to identify the specific software attributes required by physiotherapists for practical use and minimize the impact on the workflow of the clinic. The adaptation to the needs of physiotherapists would improve the design and functionality of the software to meet the expectations of physical therapists to avoid dissatisfaction with its use [5]. However, despite these expectations, evidence about software requirements identified from the participation of physiotherapists in activities of design is limited and focused on very specific issues [19,20]. Some studies focused on physiotherapists' perspectives on ICT (use, acceptability, requirements, and barriers to adoption) [9,21] and factors influencing practical use during the therapeutic process and the skills needed to use ICT [19]. In the meantime, some surveys have evidenced that there are PMS attributes required by physiotherapists that are still absent in their current PMS [2], and physiotherapists report low job satisfaction with some functionalities of their PMS [5]. However these are based on the experience in other health professions, interviews, and opinions [1,2]. To the best of our knowledge, no focus groups have been conducted to address the specific needs of physiotherapists for the practical use of a PMS for their day-to-day professional practice from a global perspective.

The aim of this study was to examine the perceptions of physiotherapists in relation to the practical use of PMS in their clinics in order to identify their needs and requirements. The identification of the physiotherapists' needs and requirements would allow us to address the software inadequacy and inefficiencies, enhancing physiotherapists' satisfaction and facilitating the adoption and implementation. The research questions for this study were as follows: (1) What PMS inefficiencies do you find for your clinical and administrative work? (2) What PMS attributes would you require to facilitate your work and improve

workflow on clinical and administrative tasks? This work could provide manufacturers with new and valued attributes for software design and development, and also guide physiotherapists on relevant attributes when benchmarking PMS solutions.

2. Materials and Methods

2.1. Qualitative Approach

The study was undertaken using a grounded theory approach, involving an inductive-reasoning process [22]. Given the dearth of research on the specific software attributes required by physiotherapists, this study used a constructionist approach to build an understanding and knowledge of the theoretical framework of the physiotherapists' perceptions of the practical use of PMS, using focus groups with physiotherapists with clinical and management expertise and experience in management software for physiotherapy services [23]. The selected approach was considered the most appropriate for the research question [22,24,25].

The focus groups were carried out by a moderator (EAM, one co-author), with the help of one assistant. The moderator graduated as a physiotherapist in the year 2000 and had some experience with PMS. Only six of the focus group participants were previously known by the moderator, who had no actual professional or commercial relationship with any of them.

2.2. Context

We conducted the study among graduated physiotherapists in Spain during the year 2020. Due to the origin of the researchers, the study was mainly carried out in the Valencian Community of Spain, with the assistance of the ICOFCV (Illustrious Official College of Physical Therapists of The Valencian Community). The Valencian Community is representative of the physiotherapy situation in Spain, where there are no major differences from the rest of the country regarding the healthcare system and physiotherapy practice. Five of the six focus groups were carried out after the general lockdown in Spain, due to COVID-19. The pandemic conditioned the implementation of the focus groups due to confinement, meeting, and geographical mobility restrictions.

A purposive sampling strategy was used to identify physiotherapists with clinical and management expertise, with any experience (either regular or occasional) in management software for physiotherapy services. Consultations with the ICOFCV (Illustrious Official Society of Physiotherapists of the Valencian Community) were held to identify professionals working in different fields of practice (musculoskeletal, pediatrics, neurology, sports, and higher education) and different sectors (public and private).

Although the final sample size was dependent on the saturation of information, 42 candidates were initially selected and contacted over the phone by the investigators to explain the project and find out their availability. The study information document (explaining the details of the research project) and consent were sent to read fully. Candidates were invited to a suitable focus group. When a candidate cancelled or did not attend his/her meeting, efforts were made to reschedule in other groups.

Previous consultations were made with the Ethics Committee at the Universitat de València to verify the need for research approval. No health or particularly sensitive data were collected. However, participants were fully informed about the content of the study and the benefits associated with the research. Participants were asked to give informed consent to participate. The data collected were completely anonymous so that neither the participants nor their responses could be identified. No compensation was received for participation.

2.3. Data Collection Methods

The qualitative design of this study involved focus groups because group interaction provides a wider range of responses that might not arise from individual interviews [26,27].

Focus groups have been used in previous studies to learn about the physicians' perceptions of electronic medical records [28,29].

Firstly, a topic guide and a script were developed based on a literature review, including a review of the functionalities of the most significant management software for several physiotherapy associations [1,2]. Secondly, a preliminary focus group was conducted to evaluate the appropriateness of the focus group script. A software engineer (with experience in designing and developing healthcare management software) and a family doctor (with experience founding and training a healthcare management software) participated and contributed to the group; changes to the script and guide were made accordingly. Posteriorly, six focus groups were conducted with the help of the revised script with predetermined (see Table 1) and backup questions in the field of clinical care and administrative tasks. Adjustments to the focus group protocol and questions were made according to early experience and the information provided by participants. Each focus group included three-to-six participants and lasted 90–120 min. Videotape, audio, and field notes were used for data collection.

Table 1. Thematic guide for focus group discussion.

Core questions
What PMS inefficiencies do you find for your clinical work?
What solutions could help to sort out such inefficiencies?
What PMS inefficiencies do you find for your administrative tasks?
What solutions could help to sort out such inefficiencies?
What functions do you miss in your current software?
Backup questions
What tools do you need in a software for your daily clinical work?
Do you use quality control and security measures for clinical care?
What needs do you have at an organizational level in your workplace?
What communication systems do you use to interact with your patients and other health professionals?
How would you improve the physiotherapy standards?

Out of the initial sample of 42 eligible participants, 27 participated in this study. The progress of the selection stages and the reasons for non-participation are presented in Figure 1. Table 2 summarizes the demographic characteristics of the participants in the focus groups. They had an average of 18.7 years of clinical experience; a big majority of participants were owners/managers (18) of physiotherapy centers. Recruitment stopped when saturation was reached, which was when no new categories or coded statements were identified. The analyses showed the adequacy and generalizability of the content, and sufficient depth of understanding was achieved in the emergent theoretical categories [30].

Table 2. Focus group participants' demographic characteristics.

Characteristics	Participants (n = 27)
Clinical experience (years)	18.7 years
Gender	Male (n = 16)
Sector	Private (n = 22) Public (n = 5)
Job	Owner/manager (n = 18) Employees (n = 6) Self-employed (n = 3)

Table 2. *Cont.*

Characteristics	Participants (n = 27)
Specialty	Musculoskeletal (n = 13) Neurology (n = 4) Primary care (n = 2) Sports (n = 2) Pelvic floor (n = 2) Pediatrics (n = 1) Others (n = 3)

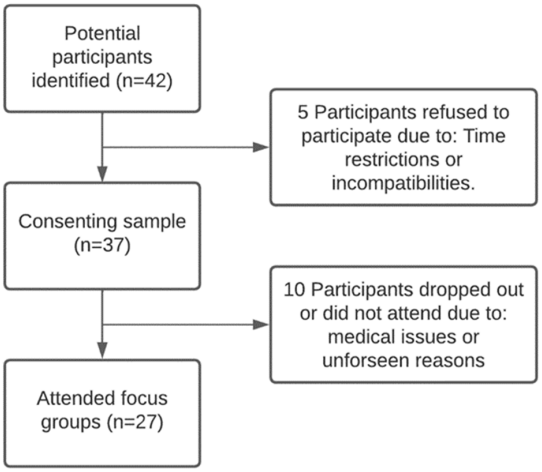


Figure 1. Flow of participant recruitment.

2.4. Data Processing and Analysis

The sessions were fully transcribed by the researchers. Transcriptions were anonymized, and each participant was assigned a number code. Field notes were also reviewed to improve accuracy. A thematic analysis approach was used to code and classify the comments in the different themes, subthemes, and categories and then compiled into two core areas of content: attributes to improve workflow in clinical care and administrative tasks. An iterative process of reading, analyzing, and coding the data was carried out individually by two of the researchers, using word-processing software to code the categories. These were grouped into similar concepts to form subthemes and themes. The researchers reviewed and compared their findings to reach a consensus throughout the process. The categorization and classification of each coded statement were systematically reviewed, discussed, and consensually validated by the research team. Three rounds of coding and discussion took place to enhance the credibility of the analysis and develop clear categories and themes [31].

To check consistency, a third researcher cross-checked the results via a blind review for the same transcripts [31]. Any disagreements between the researchers were resolved by discussion. Confirmability was enhanced when the same categories emerged from the data of subsequent groups' transcripts.

3. Results

3.1. Attributes Required for Clinical Care

In this area, the thematic analysis identified six subthemes that defined two broad themes, with three subthemes each. All of them, their categories, the frequency of coded statements, and the word association are summarized in Table 3.

Table 3. Summary of physiotherapy PMS attributes required for clinical care, frequency of coded statements, and word association.

Theme	Subtheme	Category of Coded Statement	Frequency	Words
Data entry and issuance of reports on patient clinical care	Templates, digitalized tools, and classification codes for data entry	Editable templates for assessment	11	Template, model, example, chart, anamnesis
		Digital patient-reported outcome measures	16	Outcome measure, questionnaire, scale, test (neck disability index, Oswestry, etc.)
		Editable body charts	10	Body map, body image, body chart, human figure, drawing
		Classifications system for health problems and physiotherapy interventions	15	Code, classification, taxonomy, diagnosis, treatment, ICD, ICF, SNOMED, Nanda
		Customizable clinical history	10	Clinical history, customize, personalize
		Compilation of clinical records	14	Compilation, record, file, folder, profile, gallery, images, videos, reports
	Digitalized tools and templates for the issuance of individualized patient reports	Templates for reports	11	Template, draft
		Exercise prescription software	19	Exercise, prescribe, program, plan, protocol, guidelines, chart
		Templates for exercise programs and guidelines		
	Digitalized measures to monitor quality of care	Patient-reported experience measures	7	Satisfaction, survey
		Reports on the quality of care provided at the center	4	Quality of care, audit
		Healthcare activity reports	19	Statistics, report, research
		Patient safety reports	3	Safety, fall, allergy, side effect, assault
Clinical-care electronic communication with patients and other health professionals	Automatized reminders for patients and professionals within the scheduling agenda	Editable agenda	15	Timetables, treatment rooms, equipment, view
		Send reminders to patients	15	Appointment reminder
		Set alerts	6	Alarm, alert, warning, reminder
	Digital health interventions (DHIs)	Videoconference	9	Videocall, videoconference, telehealth, telerehabilitation, teleconsultation, telemedicine, telematic
		Chat	3	Chat
		Corporate mail integrated	3	Corporate email
	Patient portal	Online appointment booking	6	Online booking, self-schedule
		Consult scheduled visits	3	Appointment history, consult
		Access to support materials	7	Portal, platform, upload, exercises, information, clinical history

3.1.1. Theme 1—Data Entry and Issuance of Reports on Patient Clinical Care

Both data entry and the issuance of reports were perceived as highly time-consuming with their current software. In order to streamline these activities, participants regarded it as relevant to integrate additional solutions in the PMS (e.g., templates, digitalized tools, or automatized registration).

- *Templates, digitalized tools, and classification codes for data entry*

To help reduce the clinical data-collection time for common health problems, participants proposed the integration of structured and editable templates. Moreover, the integration of digitalized tools for assessment, such as body charts to digitally draw and

fill in, patient-reported measures to be filled out digitally by patients, and classification systems to code health problems, were seen as useful solutions. Although participants focused on these structured tools, they also expressed their need to customize such tools and have open sections to provide them with additional information to support patient care.

"What I want in the end is to have my templates in the program, and if I'm going to treat a patient with a cervical problem, I can take that template and edit it."

"In the clinical history, I like to have a body chart, where the patient or the physiotherapist can paint or draw on the chart."

"And then as it was said, to have outcome measures or questionnaires like the Oswestry or many others specific for each patient that you are attending."

- *Digitalized tools and templates for the issuance of individualized patient reports*

Participants felt that the issuance of individualized patient clinical-care reports is a frequent requirement from providers (e.g., insurance companies, lawsuits, colleagues and other healthcare professionals, and patients), but they considered it an additional burden to patient care and a load to be reduced. Specific templates for these reports were the main suggested software solution.

"But it's not the same if the report is for a lawsuit, a doctor, or a colleague. So, having different basic models of reports about the state of the patient with fields to complete."

In contrast, participants regarded the issuance of patient educational activities as essential for care. Despite this, they felt that educational reports are underutilized because the current software did not include educational digitalized resources (e.g., images of pathologies and guidelines). Participants reported that an exercise software displaying digitalized videos/images/models and other educational digitalized resources should be integrated into the software.

"Hence, I would like to prepare a document that I can print or send to the patient by email with the therapeutic exercises that I previously explained, the recommendations, so he can take it in writing."

- *Digitalized measures to monitor quality of care*

Participants felt that providing information on the quality of the clinical care provided in the practice is a growing need, but their current software did not provide enough tools for its collection and analysis. Two combined software solutions were reported. The first involved integrated digitalized questionnaires (e.g., satisfaction questionnaires) and quality measures of processes and outcomes. The second involved the integration of automatized registration for predefined quality indicators.

"The program can't rate that if there isn't a satisfaction survey, and it would be interesting to have it on the software."

"We do have the option of making statistics (about quality and activity), but it falls short."

3.1.2. Theme 2—Clinical-Care Electronic Communication with Patients and Other Health Professionals

Participants considered that electronic communication via current software helps them to schedule appointments, send SMSs, and other perform functionalities. Nevertheless, they regarded that their software needed to integrate additional elements (e.g., reminders, video calls, etc.) in order to avoid some interruptions in the practice workflow and dysfunctions in their digital health interventions (DHIs).

- *Automatized reminders for patients and professionals within the scheduling agenda*

Participants stated that many patients often forgot their appointments, thus creating unjustified interruptions in the practice workflow. Their current scheduling agenda often did not prevent these occurrences. Hence, they expected that the integration of reminders for patients 24–48 h before their appointment would help them avoid these interruptions.

Other interruptions were also associated with the agenda (e.g., simultaneous use of the same therapeutic space or equipment by two physiotherapists). Participants also required reminders for professionals that are aimed at reducing these overlaps (e.g., the agenda screen with the spaces and equipment free).

"For us, it is a problem how to fit in the program the availability of physiotherapists and the treatment rooms by time slots."

"To remind the appointments is also important, because there are patients who systematically miss appointments."

- *Digital health interventions (DHIs)*

Participants argued the need to incorporate telehealth care into the practice and expected the integration of DHI at the moment to be easy, because the patients' willingness to use communication technologies had increased during the COVID-19 pandemic. They reported that many current software programs need to integrate video call, chat, and email to communicate with patients.

"We have been attending patients on the phone and from the hospital we were offered the possibility of installing equipment to make video calls with patients, because many of them were housebound and they were asking for help regarding exercises."

"Then as well, going further, the future of telerehabilitation, the chat is essential."

"But what happens with these emails? So it would be great if within this program, each specialty had a corporate email so that communications were registered and stored."

- *Patient portal*

Participants considered interesting the possibility of having a portal to be accessed by clients to book appointments online, check pending and made appointments, and simplify the patients' access to all educational plans (e.g., exercise programs). It was argued that the portal could save time scheduling or making phone calls.

"And the agenda so that the patient can schedule an appointment himself. He could access the program, see a slot, and book it. Because it's very difficult for me, when I am on my own, I waste a considerable time trying to set an appointment."

"Normally you send them materials, but if you had the platform to upload what you want them to do, it would be easier."

3.2. Attributes Required for Administrative Tasks

In this thematic area, six subthemes were identified that defined three broad themes. All of them, their categories, the frequency of coded statements, and the word association are summarized in Table 4.

Table 4. Summary of physiotherapy PMS attributes required for administrative tasks, frequency of coded statements, and word association.

Theme	Subtheme	Category of Coded Statement	Frequency	Words
Management of administrative documents and marketing communications	Automatized issuance of routine documents	Automate the issuance of routine documents	9	Automate, automatic
		Informed consent templates and other patient authorizations (e.g., data protection)	11	Consent, data protection
		Templates for common documents (e.g., bills and attendance receipts)	4	Template, bill, attendance receipt
		Easily fill in and sign documents for patients and professionals	11	Sign, digital signature, digital certificate
		Digitalize external documents	10	Upload, scan

Table 4. *Cont.*

Theme	Subtheme	Category of Coded Statement	Frequency	Words
Management of administrative documents and marketing communications	Communication tools for marketing strategies	Links to external communication applications	15	WhatsApp, SMS, email
		Allow for mass mailings of communications (advertising, promotions, etc.)	3	Advertising, newsletter, invitation,
		Repository of standard messages that can be modified	3	Template, model
Billing and accounting of payments and supplies	Flexible billing and automatized accounting of payments	Allow different payment methods	5	Prepay, online payment
		Fees configuration	6	Code, fare, tariff, price
		Flexibility in the application of fees	4	Modify, discount
		Automatic synchronization of payment with accounting	3	Billing, quantify, account
		Financial reports	5	Report, statistic, income, expenses
	Automatized accounting of supplies to control stock	Stock reports (expenses, sales, etc.)	3	Stock, inventory, material
		Notifications to replenish consumables	3	Notification, alert, alarm
Access to PMS	Interoperability	Access from different devices	7	Devices, smartphone, tablet, computer
		Ability to import and export data with ease	4	Import, export, Excel
	Data security tools to face failures, inadequate use, and threats	Configuration of users and access permissions	6	Profile, permission, access
		Security measures against computer threats (antivirus, encryption, etc.)	7	Security systems, encryption, hacker
		Saving and backup copies	6	Copy, backup
		Different data-hosting options	5	USB, hard disk, device

3.2.1. Theme 1—Management of Administrative Documents and Marketing Communications

Participants often considered that issuance of both administrative documents and marketing communications took too much time with their current software. To streamline these activities and devote more time to clinical care, participants regarded it as relevant to integrate additional solutions in the software (e.g., templates, digitalized tools, or automatized registration).

- *Automatized issuance of routine documents*

Participants highlighted that filling in, signing, and issuing administrative documents (e.g., attendance certificates, invoices, informed consent, and data protection) is a daily routine, which is growing due to legal requirements. They felt that the load of these tasks notably increases when the patient's signature must be included and when providers periodically request documents to monitor care. Two software solutions were reported. The first is the integration in the software of structured and editable specific templates, which could automatically be filled using stored data. Thus, the load would be reduced to review, edit (if necessary), and sign it. The second is having an easy digitalization of the signature of patients and professionals (e.g., by means of a tablet or similar).

"We print them out, sign them, and then scan them and save them in the history. They cannot be signed on the computer, there is no digital signature."

"Like online banking. When we have to make a report, prepare an attendance certificate or an invoice, we could do it automatically."

- *Communication tools for marketing strategies*

Participants felt that the use of marketing strategies is a growing need to strengthen customer relationships; hence, their current software needed integrated additional elements

for both, improving the efficiency of their current marketing strategies and incorporating news. Participants considered that PMS should have an automatized system to assist them in the selection of usual marketing messages and clients to be contacted and provide links with external communication applications or channels (e.g., email, WhatsApp, and SMS) to select according to marketing needs.

"Newsletters, invitations to workshops, informative talks, I think it is also important that you can filter, for example, who you want to send them to, filtering by age, sex, condition, etc."

"Software communication with patients should be easy to use, versatile and capable of sending emails, WhatsApp messages or SMS."

3.2.2. Theme 2—Billing and Accounting of Payments and Supplies

According to participants, the software should facilitate the control of the economic aspects of the center. Private-sector physiotherapists expressed that their current PMS had strong limitations in regard to easy administration, billing and accounting payments, and indicating stock supplies that are available for treatments. New software solutions were proposed for these areas.

- *Flexible billing and automatized accounting of payments*

To help billing, participants believed that the PMS should provide them the opportunity to easily update fees according to time, demands, or special circumstances and should admit different payment methods. To help accounting, PMS should automatize the registration of payments with the accounting.

"If you work alone, it's simple, but if you are co-working where there are different sessions and rates, it should allow you to easily modify, quantify and link it to the invoicing."

- *Automatized accounting of supplies to control stock*

Physiotherapists reported the need of a section to keep track of consumption (stock available, regular consumption, expenses, sales, alerts, etc.) and notifications to replenish consumables in order to control stock supplies at the clinic.

"The management software should include the control of supplies, I don't know if exhaustive or at least if you could enter the shopping basket."

3.2.3. Theme 3—Access to Practice Management Software (PMS)

Participants felt that the need to access their PMS online is increasing in contrast to the traditional on-site access. Nevertheless, they found difficulties in interoperating and exchanging information online with their current software. Moreover, in both modalities, online and on-site, data security and maintenance were a major concern among participants. Emphasis was placed on the need for the PMS to help comply with current regulations.

- *Interoperability*

Participants requested that software solutions be accessible from different devices and operating systems to facilitate usability. The ability to import and export data with ease in a compatible format was regarded as important to facilitate some clinic management tasks.

"The software should allow the use from a computer, a tablet or a mobile phone, so in the case of attending a home visit, not having to take my computer with me."

- *Data security tools to face failures, inadequate use, and threats*

Omissions and system failures were a common cause of data loss and work duplication. Automatic saving and backup copies should be allowed in the software. Furthermore, allowing different hosting options for data maintenance could reduce data loss and recovery.

"Because apart from the fact that sometimes you forget to save, other times it crashes and everything I had posted has been deleted, the program has not saved it automatically."

Participants agreed on the convenience to regulate and control data access by configuring permissions for software users. Offering security measures for computer threats like viruses or hackers was seen as important functionalities.

"Reviewing data on a patient who is not under your specific care is a serious breach, and that has to be picked up by the documentation system."

Overall, clinical care took most of the discussion time in all focus groups, with more than 60% of the discussion time and coded statements on average.

4. Discussion

This research provides experiential knowledge on the PMS attributes required by physiotherapists in order to facilitate workflows on both clinical and administrative activities and to overcome the inefficiencies perceived on current software programs. A total of five themes were identified (data entry and issuance of reports on patient clinical care, clinical-care electronic communication with patients and other health professionals, management of administrative documents and marketing communications, billing and accounting of payments and supplies, and access to PMS). In total, 43 specific attributes (categories) emerged and were classified into 12 subthemes.

In general, many issues identified during the focus groups were reflected in the different professional physiotherapy associations' guides published to counsel their members on assessing and choosing software solutions [1,2]. Some disparities arise due to differences in the national standard requirements to register, the professional duties and responsibilities, or the national regulations (e.g., general data protection regulation). However, these guides were based on a literature review, the experience in other health professions, and informal discussions with members and consultations with leading physiotherapists and health information technology experts [1,2].

To the best of our knowledge, this is the first study to globally explore the perceptions of physiotherapists in relation to the practical use of PMS in their clinics using focus groups. Messer and Egger [19] conducted a qualitative study performing interviews with physiotherapists and experts to learn the specific requirements of physiotherapists on the practical use of software in the therapeutic process, and many themes coincide with our research. However, the themes in that study were quite general, involved only the clinical care, and the sample size for the interview (n = 13) was small. Merolli et al. (2021), in their qualitative study, focused on developing survey instruments to collect the physiotherapists' and patients' perceptions on the uptake and acceptance of digital health interventions in physiotherapy [21]. Postolache et al. (2017) evaluated the perspectives of physiotherapists and patients on needs, requirements, and barriers for EHR adoption for physiotherapy [9]. All in all, little research has been performed on the specific attributes required by physiotherapists on the practical use of practice management software, which covers not only clinical aspects but all the non-clinical aspects relevant to run a physiotherapy center.

Our study used the grounded theory approach to build an understanding and knowledge of the theoretical framework of physiotherapy PMS. Six focus groups with experienced physiotherapists were carried out, and a thematic analysis was undertaken to code and classify the comments. Measures were adopted to maintain consistency and enhance credibility. As a consequence of all of these methods, our study identified a wide conceptual framework to describe the areas, themes, and subthemes relevant to physiotherapy management software. In our opinion, this framework makes it easy to break and understand a multidimensional and complicated subject. Moreover, our approach appears to be more comprehensive than previous approaches to learn the needs of the physiotherapy collective regarding PMS.

During the development of the focus groups, clinical-care issues took most of the discussion time and coded statements, giving us a good idea of the inadequacy and inefficiencies of the current PMS for physiotherapy. The rest of the time and issues dealt with administrative tasks, security and confidentiality, communication, economic issues, legal and regulatory requirements, or technical aspects, which concerned physiotherapists'

work. These were finally gathered into one broad area called "Administrative tasks" to avoid separating or overlapping issues. The diversity in the demographic characteristics of the participants provided insight into different physiotherapy specialties, which require flexibility and customization in a PMS, for example, in anamnesis and clinical history documents, questionnaires, and scales. Also, the participants working in the private sector had greater concerns about the economic management, business and performance statistics, or marketing strategies than participants working in the public sector, which is public and free of charge. Despite our novel contribution using focus groups, the study was carried out in the Spanish region of the Valencian Community, and most of the participants were living or working in this region, so caution must be applied when trying to extrapolate the results.

Our findings have important applications. This study allows us to identify the PMS attributes required by physiotherapists that may influence in the efficiency and functionality of the software. Given the low levels of adoption and satisfaction with physiotherapy PMS [5–9] these findings might be of great relevance for the design of future software solutions to enhance the adoption and satisfaction with these programs. Furthermore, in the last few years, the COVID-19 pandemic has given a new impulse and greater awareness to digital health technologies in physiotherapy, increasing the use for care delivery [32,33]. However, little research has been published to date after the pandemic; this study provides a valuable insight into the physiotherapists' experiences and needs post-COVID-19.

The main strength of our study is based on the methodological aspects of the qualitative study, which was based on a literature review of previous studies and qualitative research using focus groups with experienced physiotherapists. This qualitative study allowed us to identify and summarize the issues relevant to physiotherapists regarding PMS requirements and processes in order to solve the inadequacy and inefficiencies present in current PMS for physiotherapy and, ultimately, to improve the adoption and implementation of PMS in physiotherapy. However, a subsequent quantitative study would be necessary in order to validate physiotherapists' expectations for the identified attributes.

5. Conclusions

In order to improve the adoption and satisfaction with physiotherapy PMS, it is necessary to identify the software attributes that can satisfy the needs and processes of physiotherapists on the practical use. Our study provides an insight into the relevant attributes in a multidimensional construct divided into two areas of content: clinical care and administrative activities. The focus group analyses led us to identify five themes (data entry and issuance of reports on patient clinical care, clinical-care electronic communication with patients and other health professionals, management of administrative documents and marketing communications, billing and accounting of payments and supplies, access to PMS), and twelve subthemes which map the framework for physiotherapy PMS well. The attributes of clinical tasks raised the most debate and concern among physiotherapists. The findings of this study provide valuable information as to what aspects are meaningful for the future design and development of physiotherapy PMS, thus providing guidance to software developers and to end-users when benchmarking PMS.

Author Contributions: Conceptualization, F.M.-M. and E.A.-M.; methodology, E.A.-M. and R.M.-S.A.; software, E.A.-M.; validation: A.E.-E., N.M.-S. and R.M.-S.A.; formal analysis, E.A.-M. and R.M.-S.A.; investigation, E.A.-M.; resources, N.M.-S.; data curation, A.E.-E.; writing—original draft preparation, R.M.-S.A. and E.A.-M.; writing—review and editing, F.M.-M.; visualization, A.E.-E.; supervision, F.M.-M.; project administration, F.M.-M. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: Data is contained within the article.

Acknowledgments: The authors want to thank the volunteers for their participation during this study, as well as Jesús Ramírez-Castillo and the ICOFCV for their support and collaboration during the study development.

Conflicts of Interest: The authors declare no conflict of interest.

References

1. Canadian Physiotherapy Association, Physiotherapy Association of British Columbia. *PABC EMR Toolkit: Implementing Electronic Medical Records in Private Practice Physiotherapy Settings*; Canadian Physiotherapy Association, Physiotherapy Association of British Columbia: Vancouver, BC, Canada, 2016.
2. Australian Physiotherapy Association (APA). *Practice Management Software Insight 2018*; Australian Physiotherapy Association: Hawthorn, Australia, 2018.
3. Physical Therapy Software Market Analysis Report, 2022–2030. Available online: https://www.grandviewresearch.com/industry-analysis/physical-therapy-software-market-report (accessed on 6 October 2023).
4. *Key Capabilities of an Electronic Health Record System*; National Academies Press: Washington, DC, USA, 2003.
5. Vreeman, D.J.; Taggard, S.L.; Rhine, M.D.; Worrell, T.W. Evidence for Electronic Health Record Systems in Physical Therapy. *Phys. Ther.* **2006**, *86*, 434–446. [CrossRef] [PubMed]
6. Michel-Verkerke, M.B. The Love-Hate Relationship of Physical Therapists with Electronic Patient Records. *Procedia Comput. Sci.* **2015**, *64*, 432–441. [CrossRef]
7. Buyl, R.; Nyssen, M. From a Paper-Based to an Electronic Registry in Physiotherapy. *Collab. Patient Centred Ehealth* **2008**, *141*, 75–81. [CrossRef]
8. Yung, A. Adoption of Electronic Health Record System in Community-Based Physiotherapy Clinics: A Pilot Case Study. *Build. Capacit. Health Inform. Future* **2017**, *2017*, 395–400. [CrossRef]
9. Postolache, G.; Oliveira, R.; Postolache, O. Designing Digital Tools for Physiotherapy. In *Interactivity, Game Creation, Design, Learning, and Innovation*; Brooks, A.L., Brooks, E., Eds.; Lecture Notes of the Institute for Computer Sciences, Social Informatics and Telecommunications Engineering; Springer International Publishing: Cham, Switzerland, 2017; Volume 196, pp. 74–88. ISBN 978-3-319-55833-2.
10. American Physical Therapy Association (APTA). *Understanding and Adopting Electronic Health Records (EHR)*; American Physical Therapy Association: Alexandria, VI, USA, 2016.
11. Merolli, M.; Gray, K.; Choo, D.; Lawford, B.J.; Hinman, R.S. Use, and Acceptability, of Digital Health Technologies in Musculoskeletal Physical Therapy: A Survey of Physical Therapists and Patients. *Musculoskelet. Care* **2022**, *20*, 641–659. [CrossRef] [PubMed]
12. Chen, C.-W. The Perspectives of Physiotherapists in Canterbury on the Use of Electronic Health Records. Ph.D. Thesis, University of Canterbury, Canterbury, UK, 2018. [CrossRef]
13. Hailey, D.; Yu, P.; Munyisia, E. Pre-Implementation Investigation of the Readiness of Allied Health Professionals to Adopt Electronic Health Records. In *Investing in E-Health: People, Knowledge and Technology for a Healthy Future*; IOS Press: Clifton, VA, USA, 2014; pp. 47–53.
14. Kruse, C.S.; Kristof, C.; Jones, B.; Mitchell, E.; Martinez, A. Barriers to Electronic Health Record Adoption: A Systematic Literature Review. *J. Med. Syst.* **2016**, *40*, 252. [CrossRef] [PubMed]
15. Clarke, A.; Watt, I.; Sheard, L.; Wright, J.; Adamson, J. Implementing Electronic Records in NHS Secondary Care Organizations in England: Policy and Progress since 1998. *Br. Med. Bull.* **2017**, *121*, 95–106. [CrossRef] [PubMed]
16. Al Ani, M.; Garas, G.; Hollingshead, J.; Cheetham, D.; Athanasiou, T.; Patel, V. Which Electronic Health Record System Should We Use? A Systematic Review. *Med. Princ. Pract.* **2022**, *31*, 342–351. [CrossRef] [PubMed]
17. Williams, D.C.; Warren, R.W.; Ebeling, M.; Andrews, A.L.; Teufel II, R.J. Physician Use of Electronic Health Records: Survey Study Assessing Factors Associated With Provider Reported Satisfaction and Perceived Patient Impact. *JMIR Med. Inf.* **2019**, *7*, e10949. [CrossRef] [PubMed]
18. Postolache, G.; Moreira, I.; Pedro, L.; Oliveira, R. Implementation of Electronic Health Record Systems in Physical Therapy. In Proceedings of the 1st Asia-Oceanian Congress for NeuroRehabilitation, Seoul, Republic of Korea, 3–5 September 2015.
19. Messer-Misak, K.; Egger, R. Specific Requirements of Physiotherapists on the Practical Use of Software in the Therapeutical Process. *Health Inform. Meets Ehealth* **2016**, *2016*, 158–166. [CrossRef]
20. Postolache, G.B.; Oliveira, R.; Postolache, O. Contextual Design of ICT for Physiotherapy: Toward Knowledge and Innovation Ecosystem. *EAI Endorsed Trans. Creat. Technol.* **2017**, *4*, 153334. [CrossRef]
21. Merolli, M.; Hinman, R.S.; Lawford, B.J.; Choo, D.; Gray, K. Digital Health Interventions in Physiotherapy: Development of Client and Health Care Provider Survey Instruments. *JMIR Res Protoc* **2021**, *10*, e25177. [CrossRef] [PubMed]
22. Corbin, J.; Strauss, A. *Basics of Qualitative Research: Techniques and Procedures for Developing Grounded Theory*; SAGE Publications: London, UK, 2014.
23. Levers, M.-J.D. Philosophical Paradigms, Grounded Theory, and Perspectives on Emergence. *SAGE Open* **2013**, *3*, 2158244013517243. [CrossRef]

24. Bogdan, R.; Biklen, S.K. *Qualitative Research for Education: An Introduction to Theory and Methods*, 2nd ed.; Allyn and Bacon: Boston, MA, USA, 1992.
25. Miles, M.B.; Huberman, A.M. *Qualitative Data Analysis: An Expanded Sourcebook*; SAGE Publications: London, UK, 1994.
26. Rodas Pacheco, F.D.; Pacheco Salazar, V.G. Grupos Focales: Marco de Referencia Para Su Implementación. *INNOVA Res. J.* **2020**, *5*, 182–195. [CrossRef]
27. Hennink, M.M.; Hennink, M.M. *Understanding Focus Group Discussions*; Understanding Qualitative Research; Oxford University Press: Oxford, NY, USA, 2014; ISBN 978-0-19-985616-9.
28. Witry, M.J.; Doucette, W.R.; Daly, J.M.; Levy, B.T.; Chrischilles, E.A. Family Physician Perceptions of Personal Health Records. *Perspect. Health Inf. Manag.* **2010**, *7*, 1.
29. Al Alawi, S.; Al Dhaheri, A.; Al Baloushi, D.; Al Dhaheri, M.; Prinsloo, E.A.M. Physician User Satisfaction with an Electronic Medical Records System in Primary Healthcare Centres in Al Ain: A Qualitative Study. *BMJ Open* **2014**, *4*, e005569. [CrossRef] [PubMed]
30. Saunders, B.; Sim, J.; Kingstone, T.; Baker, S.; Waterfield, J.; Bartlam, B.; Burroughs, H.; Jinks, C. Saturation in Qualitative Research: Exploring Its Conceptualization and Operationalization. *Qual. Quant.* **2018**, *52*, 1893–1907. [CrossRef]
31. Lillo-Navarro, C.; Medina-Mirapeix, F.; Escolar-Reina, P.; Montilla-Herrador, J.; Gomez-Arnaldos, F.; Oliveira-Sousa, S.L. Parents of Children with Physical Disabilities Perceive That Characteristics of Home Exercise Programs and Physiotherapists' Teaching Styles Influence Adherence: A Qualitative Study. *J. Physiother.* **2015**, *61*, 81–86. [CrossRef] [PubMed]
32. Rausch, A.-K.; Baur, H.; Reicherzer, L.; Wirz, M.; Keller, F.; Opsommer, E.; Schoeb, V.; Vercelli, S.; Barbero, M. Physiotherapists' Use and Perceptions of Digital Remote Physiotherapy during COVID-19 Lockdown in Switzerland: An Online Cross-Sectional Survey. *Arch Physiother* **2021**, *11*, 18. [CrossRef] [PubMed]
33. Reynolds, A.; Awan, N.; Gallagher, P. Physiotherapists' Perspective of Telehealth during the COVID-19 Pandemic. *Int. J. Med. Inform.* **2021**, *156*, 104613. [CrossRef] [PubMed]

ARTÍCULO II

Arza-Moncunill, E., Medina-Mirapeix, F., & Martín-San Agustín, R. (2023). Development and validity of the expectations of physiotherapists questionnaire on practice management software. *PeerJ*, *11*, e16246. doi 10.7717/peerj.16246

Development and validity of the expectations of physiotherapists questionnaire on practice management software

Eduardo Arza-Moncunill[1], Francesc Medina-Mirapeix[2] and Rodrigo Martín-San Agustín[1]

[1] Department of Physiotherapy, University of Valencia, Valencia, Spain
[2] Department of Physiotherapy, University of Murcia, Murcia, Spain

ABSTRACT

Background. Despite the growing trend in the use of digital technologies in physiotherapy, the overall adoption of both, practice management software (PMS) and electronic health records in physiotherapy clinics has been low and slow over time. In order to learn what factors determine the adoption of these technologies by physiotherapists, there is a need to examine the expectations of physiotherapists (EPs) on specific software attributes. The main aims of this study were to develop a questionnaire to measure and describe the EPs towards PMS. The knowledge of these EPs will be useful to guide PMS design in order to improve physiotherapists' satisfaction.

Methods. Instrument development study with validity and reliability testing. The development of this questionnaire was conducted in three phases: identification of attributes to be explored, development of the items, pilot study, and psychometric testing. The questionnaire was distributed to chartered physiotherapists. A total of 272 participants completed the questionnaire.

Results. A series of analysis were conducted to assess item reduction, factor structure of the questionnaire and metric properties of multi-item scales. From the initial 43 attributes, the final version of the questionnaire consisted of 26 items on EPs, grouped in nine scales and two areas (clinical care and administrative activities). As a result, all scores had strong item-scale correlations, excellent item scaling success, and good internal consistency (Cronbach alpha coefficients of $>.7$). Our study also showed that current EPs were high towards most of the items, only two scales concentrated most of the attributes with the least expectations (monitoring quality of care and digital health interventions). Our study included physiotherapists with and without experience with PMS, and it showed that both groups had a similar pattern of expectations. Our study provides a valuable questionnaire of EP on PMS attributes for clinical care and administrative activities and shows a detailed development process.

Subjects Kinesiology, Healthcare Services, Sports Injury, Rehabilitation, Sports Medicine
Keywords Validity , Questionnaire, Practice management software, Physiotherapists

Submitted 23 March 2023
Accepted 14 September 2023
Published 17 October 2023

Corresponding author
Francesc Medina-Mirapeix,
mirapeix@um.es

Academic editor
Roy La Touche

Additional Information and Declarations can be found on page 12

DOI **10.7717/peerj.16246**

How to cite this article Arza-Moncunill E, Medina-Mirapeix F, Martín-San Agustín R. 2023. Development and validity of the expectations of physiotherapists questionnaire on practice management software. *PeerJ* **11**:e16246 http://doi.org/10.7717/peerj.16246

INTRODUCTION

Institutions like the United Nations, the World Health Organization or the European Union have recognized the value of digital technologies to improve healthcare delivery (*Gagnon et al., 2009*; *Peterson, Hamilton & Hasvold, 2016*; *World Health Organization. Regional Office for Europe, 2018*; *Bonacina et al., 2021*) due to advantages such as improving the accessibility and exchange of information, healthcare quality and safety, or the efficiency and productivity among others (*McGinn et al., 2011*; *Nguyen, Bellucci & Nguyen, 2014*; *Peterson, Hamilton & Hasvold, 2016*). In particular, there has been a growing trend in physiotherapy in the use of practice management software (PMS) which focus on practice management aspects of the business (*e.g.*, appointment booking, billing, and accounting; *Physiotherapy Association of British Columbia, Canadian Physiotherapy Association*), electronic health records functionalities (*e.g.*, medical history, images, test results, and treatment plans), or telerehabilitation (*Vreeman et al., 2006*), considered as an alternative to usual face-to-face treatments with benefits in multiple pathologies (*Rausch et al., 2021*). In spite of that positive trend towards these technologies, their overall adoption in the physiotherapy clinics has been low and slow over time (*Vreeman et al., 2006*; *Postolache et al., 2015*; *Messer-Misak & Egger, 2016*; *Postolache, Oliveira & Postolache, 2017*; *Yung, 2017*).

During the past decade, there has been an interest in learning what factors determine the adoption of these technologies by physiotherapists (*Vreeman et al., 2006*). Such interest has further increased since the COVID-19 pandemics (*Rausch et al., 2021*; *Reynolds, Awan & Gallagher, 2021*). Most studies about this topic used cross-sectional surveys (*Messer-Misak & Egger, 2016*; *Postolache, Oliveira & Postolache, 2017*; *Rausch et al., 2021*; *Reynolds, Awan & Gallagher, 2021*), and the questionnaires often addressed experiences in the use of digital technologies (*Messer-Misak & Egger, 2016*; *Postolache, Oliveira & Postolache, 2017*), attitudes towards technologies (*Rausch et al., 2021*), requirements for the PMS (*Australian Physiotherapy Association (APA), 2018*) and/or physiotherapists (*e.g.*, training, formation) (*Rausch et al., 2021*), beliefs on benefits and barriers of their adoption (*Tanriverdi & Iacono, 1999*; *Rausch et al., 2021*; *Reynolds, Awan & Gallagher, 2021*), patients' satisfaction (*Laver et al., 2012*; *Reynolds, Awan & Gallagher, 2021*), and physiotherapists' job satisfaction (*Reynolds, Awan & Gallagher, 2021*).

As a consequence of all these studies, multiple recommendations have been proposed to reduce barriers and to increase positive attitudes and satisfaction with digital technologies (*Vreeman et al., 2006*; *McGinn et al., 2011*; *Rausch et al., 2021*; *Reynolds, Awan & Gallagher, 2021*). These recommendations mainly focused on the design of an adequate software, which should meet or exceed physiotherapists' expectations to avoid dissatisfaction with its use (*Vreeman et al., 2006*). In spite of the apparent relevance of expectations, which is a belief that an object possesses or should possess a particular attribute (*Cardello, 2007*), expectations of physiotherapists (EPs) have received scarce attention. While other theories were closely examined by specific questionnaires, minor approaches have been made to examine EPs on specific PMS attributes (*e.g.*, software use for the therapeutic process; *Messer-Misak & Egger, 2016*). Moreover, there is a lack of specific questionnaires. Considering this, a questionnaire created to examine EPs on specific PMS attributes could

be useful to guide PMS design in order to improve physiotherapists' satisfaction, and thus, facilitate its implementation in clinics.

Thus, the main aims of this study were to develop a questionnaire to measure EPs and to describe the EPs towards PMS. The questionnaire will be named "Expectations of Physiotherapists Questionnaire on Practice Management Software" (EPQPMS).

MATERIALS & METHODS

The development of this questionnaire was conducted in three phases: (I) identification of the attributes to be explored on the basis of a literature review and a qualitative study; (II) items for each one of the identified attributes were developed and tested for clarity and relevance through cognitive pretesting with potential respondents and focus group participants; (III) the questionnaire psychometric properties were examined in a survey among physiotherapists.

Phase 1: identification of attributes to be explored

Several steps were taken to get a comprehensive overview of this subject and to identify the attributes to be explored. Firstly, a literature review of the relevant publications was carried out. The most relevant national and international management programs, identified in consultations with national and international physiotherapy associations, were studied to learn the main features and conditions. Secondly, six focus groups were conducted including physiotherapists with knowledge and experience on this topic to identify the needs on PMS. Videotape, audio, and field notes were used for data collection. Finally, a topic guide was developed based on the theoretical framework. The results of this phase are reported elsewhere (in revision). In summary, twelve subthemes of attributes grouped in two areas were identified: clinical care and administrative activities. In the clinical care area, the subthemes focused on templates, digitalized tools, and classification codes for data entry; digitalized tools and templates for the issuance of individualized patient reports; digitalized measures to monitor quality of care; automatized reminders for patients and professionals within the scheduling agenda; digital health interventions (DHI); and patient portal. In the administrative activities area, the subthemes focused on automatized issuance of routine documents; communication tools for marketing strategies; flexible billing and automatized accounting of payments; automatized accounting of supplies to control stock; interoperability; data security to face failures, inadequate use and threats.

Phase 2: development of the items

The objective of this phase was to construct questions based on the attributes identified. The precise wording of the items was based on the physiotherapists' comments in the focus groups and modified through a process of discussion and consensus among the research team. The questions were presented in an array format. Each area included an overall question that was phrased, "The desirable software for your center should allow (the following attributes)".

A 7-point Likert scale was used for the responses, ranging from "very much disagree" to "very much agree". An initial pool of 43 items were phrased, 22 in the subthemes of the clinical care area and 21 in those of the administrative activities area.

The questionnaire was pretested for clarity and adequacy of content with 11 physiotherapists in two focus groups. Four questions were rephrased because they were leading to misunderstandings. Thus, in two items, five of the physiotherapists expressed doubts about the examples used to explain the item. In the other two items, four and three physiotherapists did not fully understand any of the functions that the item wanted to express. The reformulation of these items, which were also items that were maintained in the final questionnaire, are included in Appendix S1. The instrument finally distributed for evaluation comprised 43 items of EPs on management software. Additionally, it included socio-demographic data.

Phase 3: pilot study and psychometric testing

In phase 3, psychometric testing of the questionnaire was carried out, surveying physiotherapists in the Valencian Community during 6 months by completing the online questionnaire on Limesurvey. The link to the questionnaire was distributed by the ICOFCV (Illustrious Official College of Physiotherapists of the Valencian Community) to all chartered physiotherapists *via* email and posted on their corporate social networks with the pertinent explanations. Eligible participants were all graduated physiotherapists who had enough digital skills to fill in the online questionnaire in order to learn their expectations on PMS. Reminders were also sent 1 and 3 months later. The answers were totally anonymous and a cookie was set to avoid repeated participations.

Data analysis

To describe the participants' socio-demographic characteristics and EP, descriptive statistics were used. For each of the two areas (clinical care and administrative activities), a series of analysis were conducted to assess item reduction, factor structure of the questionnaire and metric properties of multi-item scales. All analyses were performed with the SPSS 28.0 (SPSS Inc., Chicago, IL, USA).

For a first item selection, variance and non-response rates for items were evaluated.

As DeVellis suggests, items that were poorly understood [*i.e.*, with high rates of non-responses ($\geq$10%)] or items with poor variability were eliminated (*DeVellis, 2016*), for the latter a standard deviations of less than 0.60 was selected, as it was done elsewhere (*Medina-Mirapeix et al., 2015*). As previously described in *Medina-Mirapeix et al. (2015)*, exploratory factor analyses were performed to identify latent factors that could be responsible for the covariation of the data. Principal components analysis and varimax rotation were used for the initial extraction of factors. Items with loadings of 0.50 or higher were retained, but items with factor loading of less than 0.40 on one factor or higher than 0.40 on more than one factor were removed (*Ware & Gandek, 1998*). A parallel factor analysis was also performed using the maximum likelihood and principal axes methods to check if there was consistency in the identified factors. In case of non-consistency, such factors were eliminated.

In a multi-trait scaling analysis, a correlation matrix of all items of each area and scale was used to test the extent to which items converge with and diverge from scales. Scales were scored with a method of averages, summing up the scores of each item in the corresponding

scale and dividing it by the number of items in that scale. Correlations between each item and its hypothesized scale were calculated and corrected for overlap by not including them in the scale. Correlations of 0.40 or higher were considered to be satisfactory; items with correlations of less than 0.40 were removed for further analyses (*Briggs & Cheek, 1986*).

Following what was described by *Ware & Gandek (1998)* and as previously carried out by *Medina-Mirapeix et al. (2015)*, scaling success rates were computed for each scale as the percentage of items within the scale that correlated more highly or significantly more highly with the hypothesized scale than with the other scales. An item correlated significantly more highly with its own scale if the correlation between the item and its hypothesized scale was more than two standard errors higher than its correlation with other scales (*Ware & Gandek, 1998*). In addition, to test the internal consistency reliability, the Cronbach alpha coefficient was calculated for each, >0.7 and >0.9 were considered acceptable and excellent, respectively (*De Vet et al., 2011*).

Finally, boxplots were created to describe the distribution of expectation scores for each attribute by area. Also, we calculated the percentages of physiotherapists who expected the presence of all items on a scale and those who did not expect any. Student's t test was used to compare the percentages between physiotherapists with or without experience with PMS.

RESULTS

A total of 272 physiotherapists completed the questionnaire. The participation included a similar proportion of men and women, 13 years of experience in average and a clear predominance of the private sector. Remarkably, only 54% of participants had experience with a PMS solution in work. The participants' characteristics are shown in Table 1.

As previously indicated, the initial questionnaire consisted of two areas, divided into six subthemes each, with 22 items in the clinical care area and 21 in those of the administrative activities area.

In the clinical care area, 10 items were eliminated in different steps: (1) in a first principal components analysis, several items showed factor loading higher than 0.40 on more than one factor: four items initially grouped in the subtheme "data entry and issuance of reports" (factor loading range from 0.417 to 0.610), and one item from the subtheme "DHI" (factor loading in two components of 0.421/0.570); (2) in a second main components analysis, one item from the subtheme "monitoring quality of care" and one item from "patient portal" showed a loading factor in two components of 0.428/0.674 and 0.401/0.557, respectively, (3) in a third main components analysis, one item from the subtheme "workflow coordination" showed a factor loading in two components of 0.444/0.670, and (4) the subtheme "workflow coordination", with two items, was eliminated due to inconsistency among the three factor analysis methods: in principal components method a factor loading of 0.798/0.805, in principal axes method a factor loading of 0.396/0.448, and in maximum likelihood method a factor loading of 0.342/0.372. Thus, for final factor analysis we had four scales and 12 items left in this area. The final result of the factor analysis of the complementary methods (*i.e.,* principal axes and maximum likelihood methods) can be seen in Appendix S2.

Table 1 Characteristics of participants ($n = 273$).

Sex	Men	48.5%
	Women	51.5%
Age	<35	39%
	35–50	53.3%
	>50	7.7%
Workplace	Physiotherapy clinic	74.7%
	Hospital 2	3.9%
	Primary health centres	5.8%
	Day care centre/Residence	2.6%
	Sports club/centre	5.8%
	Others	7.2%
Job Position	Owner/Manager	40%
	Employee in a private centre	27.7%
	Self-employed	25.2%
	Employee in a public centre	7.1%
Years of experience	Average	13 years
Years working in that centre	Average	8.4 years
N° of physiotherapists working at the centre	1	29%
	2 or 3	40%
	≥4	31%
Clerk staff	Yes	49%
	No	51%
Experience with PMS	Yes	54%
	No	46%

In the administrative activities area, seven items were eliminated in different steps: (1) in a first principal components analysis, two items initially grouped in the subtheme "issuance of routine documents" and two items in the subtheme "billing and accounting" showed factor loading higher than 0.40 on more than 1 factor (factor loading range from 0.434 to 0.627 and 0.416 to 0.621, respectively), (2) in a second principal components analysis, one item in the subtheme "data security" showed a loading factor in two components of 0.479/0.611, and (3) the two items in the subtheme "interoperability" initially grouped in the principal components analysis with items from "Data security", were eliminated for correlating less than two standard errors on that scale ($r = 0.610$ and $r = 0.541$) *versus* "issuance of routine documents" ($r = 0.556$ and $r = 0.501$). Thus, for final factor analysis we had five scales and 14 items left in this area.

In resume, from the initial 12 subthemes, only two subthemes (workflow coordination and interoperability) were excluded from the questionnaire, while two subthemes emerged into a single subtheme (data entry and issuance of reports).

Structure of the questionnaire and metric properties

Tables 2 and 3 show how the items included in the final factor analyses of each area loaded significantly onto their scales and how they were named.

Table 2 Factor analysis of 12 items of the clinical care area.

Scales	Items	Value for factor			
		1	2	3	4
Data entry and issuance of reports	Editable body charts	**0.816**	0.171	0.128	0.098
	Digitalized patient-reported outcome measures	**0.815**	0.238	0.091	0.094
	Templates for patients' clinical reports	**0.723**	0.209	0.191	0.057
	Editable templates for assessment	**0.710**	0.275	0.162	0.236
	Templates for exercise programmes and recommendations	**0.670**	0.154	0.101	0.169
Monitoring quality of care	Quality measures	0.268	**0.855**	0.188	0.228
	Healthcare activity reports	0.265	**0.829**	0.080	0.087
	Patient safety reports	0.341	**0.793**	0.198	0.209
Digital health interventions	Videoconference	0.190	0.105	**0.868**	0.184
	Chat	0.211	0.239	**0.862**	0.096
Patient portal	Online appointment booking	0.143	0.167	0.109	**0.890**
	Consult scheduled visits	0.230	0.203	0.169	**0.826**

Notes.
Bold type indicates primary loading for each item.

Table 3 Factor analysis of 14 items of the administrative activities area.

Scales	Items	Value for factor				
		1	2	3	4	5
Issuance of routine documents	Templates for common documents	0.186	**0.859**	0.217	0.145	0.079
	Automate the issuance of routine documents	0.224	**0.829**	0.211	0.116	0.076
	Easily fill in and sign documents for patients and professionals	0.059	**0.594**	0.332	0.105	0.246
Data security	Saving and backup copies	0.229	0.329	**0.779**	0.077	0.118
	Security measures against computer threats	0.302	0.257	**0.757**	0.099	0.069
	Configuration of users and access permissions	0.019	0.145	**0.756**	0.214	0.203
Billing and accounting	Fees configuration	**0.843**	0.197	0.194	0.172	0.185
	Flexibility in the application of fees	**0.807**	0.082	0.121	0.239	0.075
	Allow different payment methods	**0.723**	0.279	0.191	0.177	0.314
Marketing strategies	Repository of standard messages	0.252	0.138	0.196	**0.811**	0.06
	Allows mass mailings of communications	0.094	−0.049	0.205	**0.752**	0.287
	Links to external communication applications	0.235	0.349	−0.016	**0.736**	−0.021
Control stock supplies	Stock reports	0.202	0.145	0.143	0.117	**0.907**
	Notifications to replenish consumables	0.189	0.131	0.170	0.127	**0.901**

Notes.
Bold type indicates primary loading for each item.

Generally, the multi-trait scaling analysis supported the scaling of items into all the hypothesized scales (Table 4). On the one hand, in the clinical care area, the item-scale

Table 4 Summary of Results for Multitrait Scaling Analysis.

Scale	Item-scale correlation range (median)	% Scaling success	Cronbach alpha
Clinical care area			
Data entry and issuance of reports	0.781–0.842 (0.816)	100	0.873
Monitoring quality of care	0.764–0.788 (0.776)	100	0.702
DHI	0.910–0.937 (0.923)	100	0.822
Patient portal	0.908–0.931 (0.919)	100	0.814
Administrative activities area			
Issuance of routine documents	0.768–0.899 (0.848)	100	0.808
Data security	0.852–0.862 (0.845)	100	0.780
Billing and accounting	0.785–0.854 (0.825)	100	0.742
Marketing strategies	0.860–0.905 (0.878)	100	0.842
Control stock supplies	0.967–0.866 (0.915)	100	0.930

correlations ranged from 0.764 to 0.937 with a percentage of scaling success of 100% for all the scales (Table). On the other hand, in the administrative activities area, the item-scale correlations ranged from 0.768 to 0.967 with a scaling success percentage of 100% for all the scales.

The final version of the EPQPMS consisted of 26 items structured in two areas, 12 items in four scales in the clinical care area and 14 items grouped in five scales in the administrative activities area (see Appendix S3). Their reliability was acceptable to excellent, with Cronbach alpha coefficients ranging from 0.702 to 0.930 (Table 4). Considering subgroups between physiotherapists, with and without experience with PMS, Cronbach's alpha coefficients were also higher than 0.700.

Description of the expectations for each attribute (item)

Figs. 1 and 2 show the distribution of the agreement in the scores reported in each one of the 26 attributes explored. For example, in the two items of the scale "DHI" a 25% of participants reported scores <4 (*i.e.,* they did not have any degree of expectations in these items), and the remaining 75% reported some level of expectation (25% with high agreement scores $\geq$ 6). In most of the items at least 50% of participants reported some level of expectation (*i.e.,* scores $\geq$ 4 or agree) and at least a 25% showed the highest score of 7 (maximum level of agreement). Regarding the floor effect, on the one hand, in nine of the 12 clinical items, less than 3% of the subjects scored 1 (in the other three items, around 6% of the subjects). On the other hand, in 12 of the 14 administrative items, less than 2% of the subjects scored 1 (in the other two items, around 5% of the subjects).

Table 5 shows the percentages of physiotherapists who expected the presence of all items on a scale in the PMS and those who did not expect any, both in total and grouped according to whether or not they had experience with PMS. While four of the five administrative activities area scales showed a low percentage (<6%) of physiotherapists not expecting to find any of the items, this only happened in two of the four clinical care area scales, where "Monitoring quality of care" and "DHI" scales showed percentages superior to 18% of physiotherapists who did not expect to find any of their items in the PMS. Similarly,

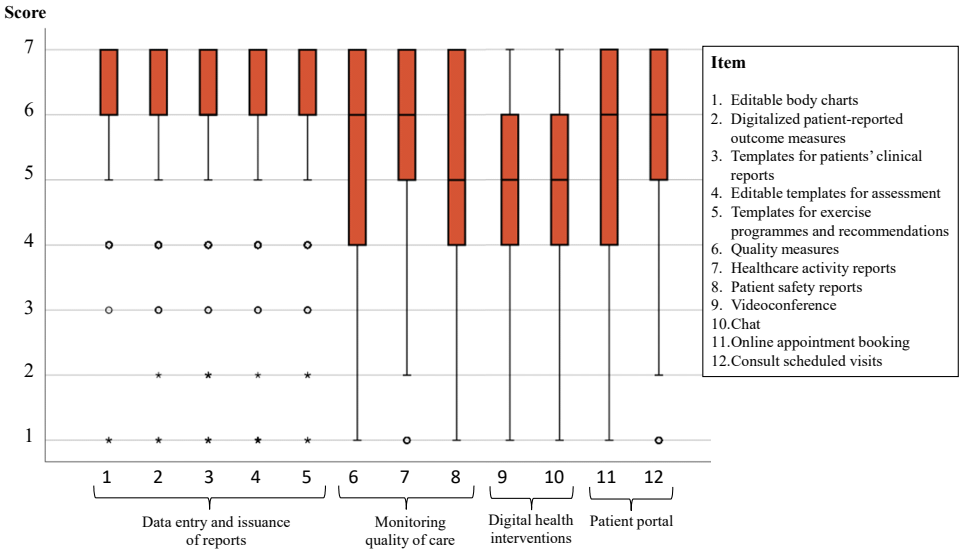


Figure 1 Scores of the 14 items in the clinical care area. A score of 1 means "very much disagree" and 7 "very much agree" with each attribute being present in a PMS.

Full-size DOI: 10.7717/peerj.16246/fig-1

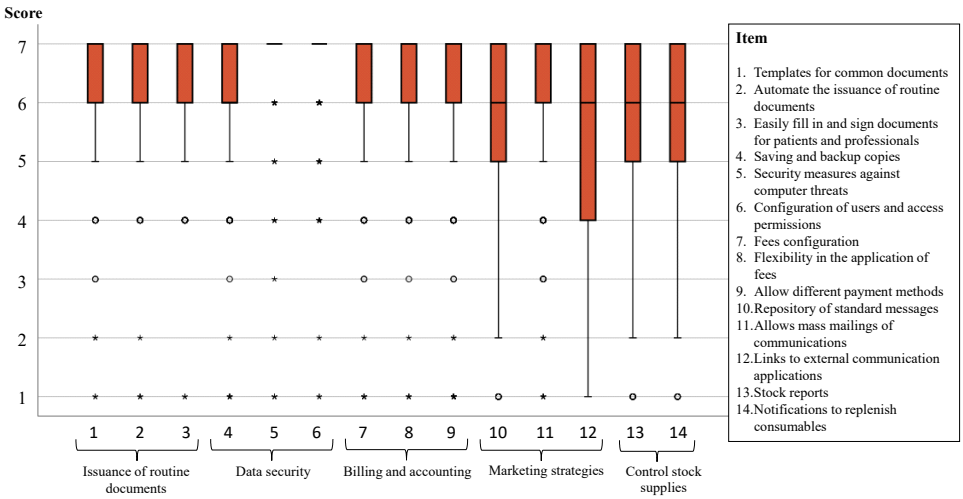


Figure 2 Scores of the 14 items in the administrative activities area. A score of 1 means "very much disagree" and 7 "very much agree" with each attribute being present in a PMS.

Full-size DOI: 10.7717/peerj.16246/fig-2

percentages greater than 75% of physiotherapists who expected to find all the items of four out of five scales in the administration activities area were observed. In addition, having or not having PMS experience did not show significant differences in any of the percentages.

Table 5 Percentage of physiotherapists who reported expectations in all items of each scale and who did not report any.

Scale	Expected the presence of none of the items	Expected the presence of all items			
	All PTs ($n = 272$)	All PTs ($n = 272$)	PTs with PMS experience ($n = 147$)	PTs without experience ($n = 122$)	Difference between groups p value
Clinical care area					
Data entry and issuance of reports	3.3%	74.3%	75.5%	72.6%	0.636
Monitoring quality of care	18.0%	61.5%	63.3%	61.6%	0.113
DHI	35.5%	42.1%	40.1%	46.4%	0.331
Patient portal	15.8%	65.5%	60.5%	72.0%	0.015
Administrative activities area					
Issuance of routine documents	1.8%	87.1%	91.8%	84.8%	0.163
Data security	1.8%	84.9%	87.1%	82.1%	0.266
Billing and accounting	5.9%	79.8%	81.0%	79.0%	0.944
Marketing strategies	4.8%	61.5%	62.6%	60.8%	0.385
Control stock supplies	16.5%	76.8%	77.6%	76.6%	0.778

DISCUSSION

To the best of our knowledge, this is the first study to develop a questionnaire aimed to examine EP towards a list of attributes for PMS. The present study provided preliminary evidence on the reliability and validity of the fixed-length EPQPMS. Nine scales pertaining to two different areas, clinical care and administrative activities could be computed. Additionally, our study showed that current EPs were high towards most of the items, and that many physiotherapists showed expectations on all items of each scale.

Our first phase to identify the attributes to be explored by the EPQPMS was based on a qualitative research. The content and number of the 12 subthemes identified in that research were very similar to the nine scales finally identified at the final phase. Moreover, all these scales had strong item-scale correlations, excellent item scaling success and good internal consistency (Cronbach alpha coefficients of $>.7$). Therefore, it seems that our qualitative approach was very efficient.

We applied multiple analysis methods (*e.g.*, multitrait scaling analysis) in our quantitative approach. *Messer-Misak & Egger (2016)* also used a qualitative and quantitative approach to propose a questionnaire regarding the requirements that therapists need to effectively deploy software solutions in the therapeutic process. Even so, the quantitative analysis was only limited to assessing the internal consistency (by Cronbach alpha coefficient) for two scales, without ruling out for example, that items could be intercorrelated. Therefore, our approach appears to be more promising and comprehensive than previous approaches used for questionnaires on EP. We consider our classification by areas and scales to be an advantage, since this facilitates the relationship between attributes of the same theme and makes it easier to understand and apply to future software.

Most of the attributes were expected by the physiotherapists. At least 75% of the physiotherapists expected to find in the PMS all the items on four of the scales in the administrative activities area and "Data entry and issuance of reports" in the clinical care area. This would suggest that the absence of these attributes in PMS could cause great disconfirmation of physiotherapists' expectations, and likely poor overall perceived quality of the software and dissatisfaction among physiotherapists. Therefore, PMS developers should consolidate such attributes and reinforce their functionalities.

Two scales concentrated most of the attributes with the least expectations. Thus, 18% of the physiotherapists did not expect to find any item of "monitoring quality of care" and 35.5% of "DHI". In relation to this last scale, previous studies have identified high levels of inexperience with telerehabilitation tools (between 83%–95% of physiotherapists do not use them) (*Rausch et al., 2021*; *Reynolds, Awan & Gallagher, 2021*). This could be a possible explanation for this low level of EP. Consequently, since these attributes are not expected in PMS, their presence could generate new needs, becoming a new line of growth for PMS, with special interest in the DHI, which facilitates the improvement of patients in various processes (*Rausch et al., 2021*).

Our study included physiotherapists with and without experience with PMS, and it showed that both groups had a similar pattern of expectations with the items of the questionnaire. Furthermore, scales had similar reliability in the two groups. That means that the questionnaire could be independently applied to each group and all recommendations cited in previous paragraphs can be applicable both for physiotherapists with and without experience with PMS. This fact is contrary to what was done in previous studies (*Messer-Misak & Egger, 2016*), where a main limitation was that junior physiotherapists with little work experience participated in the survey and did not analyze differences compared to experienced physiotherapists.

Our findings have important applications. First, to the best of our knowledge, our study is the first to examine EPs towards PMS from a global approach, considering multiple requirements from different aspects (from editable body charts, communication with patients, to payments and stock control). This is essential to be able to develop software that can satisfy EP, so our information would be valuable for the different developers of specific physiotherapy software. Furthermore, these attributes identified for the first time, would allow analyzing the degree of compliance with them in certain software. Thus, future studies should analyze different software present in the market and the presence or not of the attributes identified in our study, preparing guides with recommendations for physiotherapists. Second, our EPQPMS questionnaire is the first validated questionnaire to measure EP, so it could be used as a model to examine EP from other regions or as an example to consider in order to measure other aspects, such as the perceptions of physiotherapists towards their software or the quality of these (*i.e.,* expectations minus perceptions).

STRENGTH AND LIMITATIONS

The main strength of our study is based on methodological aspects. The questionnaire, generated to examine the EP, was carried out following several phases: first using focus

groups for a first approach, second a cognitive pre-test to ensure a good understanding of the questions, and a third phase for its validation with a sufficient sample size. In addition, for the validation analysis of the questionnaire, multiple tests and statistical procedures were used. Finally, the scales were developed and showed similar reliability in both physiotherapists with and without experience with PMS.

Despite our novel contributions, this study is not without limitations. First, the study was carried out in the Spanish region of the Valencian Community and most of the participants were living or working in this region, so caution must be applied when trying to extrapolate the results. Second, as the recruitment method was mass mailing to physiotherapists, an optimal level of control over the sample was not obtained. Third, while support for the validity of EPQPMS was identified, the validity of an instrument cannot be fully established based on a single administration study.

CONCLUSIONS

In order to satisfy physiotherapists on the use of PMS, it is first necessary to know their expectations towards the software. Our study provides a valuable questionnaire of EP towards attributes of PMS for clinical care and administrative activities. It also shows a detailed development process, which can help to develop other EP questionnaires including new and relevant attributes in other sites or times. Finally, the results showed that while most physiotherapists had high expectations in all items of each scale, especially those for administrative activities and regardless of whether or not they had experience in PMS, a relevant proportion of physiotherapists had null expectations on the items related with "Digital Health Interventions".

ACKNOWLEDGEMENTS

The authors thank the volunteers for their participation during this study, Jesús Ramírez-Castillo for his collaboration during the study development, and the ICOFCV for the assistance provided to broadcast the study among their members.

ADDITIONAL INFORMATION AND DECLARATIONS

Funding

The authors received no funding for this work.

Competing Interests

The authors declare there are no competing interests.

Author Contributions

- Eduardo Arza-Moncunill conceived and designed the experiments, performed the experiments, prepared figures and/or tables, authored or reviewed drafts of the article, and approved the final draft.

- Francesc Medina-Mirapeix conceived and designed the experiments, analyzed the data, prepared figures and/or tables, authored or reviewed drafts of the article, and approved the final draft.
- Rodrigo Martín-San Agustín conceived and designed the experiments, analyzed the data, prepared figures and/or tables, authored or reviewed drafts of the article, and approved the final draft.

Data Availability

The following information was supplied regarding data availability:

The data and the codebook are available in the Supplemental Files.

Supplemental Information

Supplemental information for this article can be found online at http://dx.doi.org/10.7717/peerj.16246#supplemental-information.

REFERENCES

Australian Physiotherapy Association (APA). 2018. Practice management software insight 2018. *Available at https://australian.physio/sites/default/files/tools/download/APA_PM_Software_Audit_27_Sep_18.pdf* .

Bonacina S, Koch S, Meneses I, Chronaki C. 2021. Can the European EHR exchange format support shared decision making and citizen-driven health science? In: Mantas J, Stoicu-Tivadar L, Chronaki C, Hasman A, Weber P, Gallos P, Crişan-Vida M, Zoulias E, Chirila OS, eds. *Studies in health technology and informatics*. Amsterdam: IOS Press DOI 10.3233/SHTI210346.

Briggs SR, Cheek JM. 1986. The role of factor analysis in the development and evaluation of personality scales. *Journal of Personality* **54**:106–148 DOI 10.1111/j.1467-6494.1986.tb00391.x.

Cardello AV. 2007. Measuring consumer expectations to improve food product development. In: MacFie H, ed. *Consumer-led food product development*. Sawston: Woodhead Publishing, 223–261 DOI 10.1533/9781845693381.2.223.

DeVellis RF. 2016. *Scale development: theory and applications*. Thousand Oaks: SAGE Publications, Inc.

De Vet HCW, Terwee CB, Mokkink LB, Knol DL. 2011. *Measurement in medicine: a practical guide*. Cambridge: Cambridge University Press.

Gagnon M-P, Légaré F, Labrecque M, Frémont P, Pluye P, Gagnon J, Car J, Pagliari C, Desmartis M, Turcot L, Gravel K. 2009. Interventions for promoting information and communication technologies adoption in healthcare professionals. *Cochrane Database of Systematic Reviews* **1**:CD006093 DOI 10.1002/14651858.CD006093.pub2.

Laver KE, Schoene D, Crotty M, George S, Lannin NA, Sherrington C. 2012. Tel-erehabilitation services for stroke. *Cochrane Database of Systematic Reviews* **2013(12)**:CD010255 DOI 10.1002/14651858.CD010255.

McGinn CA, Grenier S, Duplantie J, Shaw N, Sicotte C, Mathieu L, Leduc Y, Légaré F, Gagnon M-P. 2011. Comparison of user groups' perspectives of barriers and

facilitators to implementing electronic health records: a systematic review. *BMC Medicine* **9**:46 DOI 10.1186/1741-7015-9-46.

Medina-Mirapeix F, Del Baño Aledo ME, Martínez-Payá JJ, Lillo-Navarro MC, Escolar-Reina P. 2015. Development and validity of the questionnaire of patients' experiences in postacute outpatient physical therapy settings. *Physical Therapy* **95**:767–777 DOI 10.2522/ptj.20140041.

Messer-Misak K, Egger R. 2016. Specific requirements of physiotherapists on the practical use of software in the therapeutical process. *Health Informatics Meets eHealth* **223**:158–166 DOI 10.3233/978-1-61499-645-3-158.

Nguyen L, Bellucci E, Nguyen LT. 2014. Electronic health records implementation: an evaluation of information system impact and contingency factors. *International Journal of Medical Informatics* **83**:779–796 DOI 10.1016/j.ijmedinf.2014.06.011.

Peterson CB, Hamilton C, Hasvold P. 2016. *From innovation to implementation: eHealth in the WHO European region*. Copenhagen: WHO Regional Office for Europe.

Physiotherapy Association of British Columbia, Canadian Physiotherapy Association. 2016. PABC EMR Toolkit: implementing electronic medical records in private practice physiotherapy settings. Ottawa: Canadian Physiotherapy Association.

Postolache G, Moreira I, Pedro L, Oliveira R. 2015. Implementation of Electronic Health Record Systems in Physical Therapy. In: *1st Asia-Oceanian Congress for NeuroRehabilitation*.

Postolache G, Oliveira R, Postolache O. 2017. Designing digital tools for physiotherapy. In: Brooks AL, Brooks E, eds. *Interactivity, game creation, design, learning, and innovation. lecture notes of the institute for computer sciences, social informatics and telecommunications engineering*. Cham: Springer International Publishing, 74–88 DOI 10.1007/978-3-319-55834-9_9.

Rausch A-K, Baur H, Reicherzer L, Wirz M, Keller F, Opsommer E, Schoeb V, Vercelli S, Barbero M. 2021. Physiotherapists' use and perceptions of digital remote physiotherapy during COVID-19 lockdown in Switzerland: an online cross-sectional survey. *Archives of Physiotherapy* **11**:18 DOI 10.1186/s40945-021-00112-3.

Reynolds A, Awan N, Gallagher P. 2021. Physiotherapists' perspective of telehealth during the Covid-19 pandemic. *International Journal of Medical Informatics* **156**:104613 DOI 10.1016/j.ijmedinf.2021.104613.

Tanriverdi H, Iacono CS. 1999. Diffusion of telemedicine: a knowledge barrier perspective. *Telemedicine Journal* **5**:223–244 DOI 10.1089/107830299311989.

Vreeman DJ, Taggard SL, Rhine MD, Worrell TW. 2006. Evidence for Electronic Health Record Systems in Physical Therapy. *Physical Therapy* **86**:434–446 DOI 10.1093/ptj/86.3.434.

Ware JE, Gandek B. 1998. Methods for testing data quality, scaling assumptions, and reliability. *Journal of Clinical Epidemiology* **51**:945–952 DOI 10.1016/S0895-4356(98)00085-7.

World Health Organization. Regional Office for Europe. 2018. *Towards a roadmap for the digitalization of national health systems in Europe: expert meeting*. Budapest: Semmelweis University.

Yung A. 2017. Adoption of electronic health record system in community-based physiotherapy clinics: a pilot case study. *Building Capacity for Health Informatics in the Future* **234**:395–400 DOI 10.3233/978-1-61499-742-9-395.

ARTÍCULO III

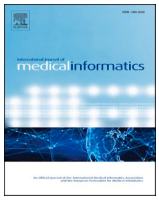
Arza-Moncunill, E., Martín-San Agustín, R., & Medina-Mirapeix, F. (2024). Measuring and describing perceived quality on physiotherapy practice management software. *International Journal of Medical Informatics*, 105406. https://doi.org/10.1016/j.ijmedinf.2024.105406

International Journal of Medical Informatics 185 (2024) 105406

Contents lists available at ScienceDirect

International Journal of Medical Informatics

journal homepage: www.elsevier.com/locate/ijmedinf



Measuring and describing perceived quality on physiotherapy practice management software

Eduardo Arza-Moncunill [a], Rodrigo Martín-San Agustín [a,*], Francesc Medina-Mirapeix [b]

[a] Department of Physiotherapy, University of Valencia, Valencia, Spain
[b] Department of Physiotherapy, University of Murcia, Murcia, Spain

ARTICLE INFO

Keywords:
Perceived quality
Practice management software
Physiotherapy

ABSTRACT

Introduction: Despite the growing trend in the use of digital technologies in physiotherapy, the overall adoption and satisfaction of both, practice management software (PMS) and electronic health records in physiotherapy clinics has been low and slow over time. Satisfaction of expectations or perceived quality (PQ) is an abstract construct based on the discrepancy between expectations and perceptions, to measure the satisfaction of physiotherapists on PMS. This study aims to develop and validate an instrument to measure PQ on PMS, and to describe the PQ of the currently available physiotherapy PMS.

Methods: Instrument development study with validity and reliability testing. The development of this questionnaire was conducted in 3 phases: identification of attributes to be explored; development of the item pairs and pretesting; pilot study for item reduction, and psychometric testing. The questionnaire was distributed to chartered physiotherapists. A total of 144 participants completed the questionnaire.

Results: A series of analyses were conducted to assess item reduction, factor structure of the questionnaire and metric properties of multi-item scales. From the initial 43 attributes, the final version of the Quality Questionnaire on Physiotherapy Practice Management Software consisted of 24 items of PQ on PMS, structured in 3 areas (clinical care, administrative activities, and accounting), which included 11, 9, and 4 items grouped into 4, 3, and 2 scales respectively. The questionnaire proved to be reliable and valid. In multitrait scaling analysis, all scores had strong item-scale correlations, excellent item scaling success, and good internal consistency (Cronbach alpha coefficients of >0.7).

Conclusions: Our study provides a valuable PQ questionnaire on PMS attributes for clinical care, administrative activities, and accounting. The attributes related to clinical care and control stock supplies showed a worse PQ. This suggests that those functions related to clinical care should be improved to facilitate greater satisfaction with physiotherapy PMS.

1. Introduction

Information and communication technologies have acquired a growing importance in healthcare. Many institutions like United Nations, the World Health Organization or the European Union widely recognize the value of digital technologies to improve healthcare delivery [1–4]. In physiotherapy, practice management software (PMS) are becoming more popular [5,6] understanding PMS as a software designed to help healthcare providers manage the administrative and operational aspects of their practices, such as appointment scheduling, billing and payment processing, patient record management, and reporting [5]. The global physical therapy software market size was estimated at USD 1.09 billion in 2021 and USD 1.16 billion in 2022, growing at a compound annual growth rate of 10.1 % from 2022 to 2030 to reach USD 2.52 billion by 2028, with North America dominating the market with a share of over 52 % in 2021 [7]. Despite the growing use of PMS in physiotherapy, the low levels of adoption and satisfaction are some of the most common problems found with these software [8–12], finding that in some countries such as the USA or Canada, only around one in four physiotherapists uses PMS [6,13]. Also, some barriers to implementation, related to software design and performance, have been identified like software inadequacy, lack of information system developers' knowledge on physiotherapy processes and workflow or not addressing tangible and practical needs [10,11]. To solve this, multiple

* Corresponding author at: Department of Physiotherapy - Faculty of Physiotherapy, University of Valencia, Calle Gascó Oliag 5, Valencia 46010, Spain.
E-mail address: rodrigo.martin@uv.es (R.M.-S. Agustín).

https://doi.org/10.1016/j.ijmedinf.2024.105406
Received 17 March 2023; Received in revised form 30 January 2024; Accepted 7 March 2024
Available online 8 March 2024

recommendations have been proposed to increase physiotherapists' positive attitudes and satisfaction with digital technologies [11,14–16]. They mainly focused on the design of an adequate software, which should satisfy physiotherapists' expectations [11].

Satisfaction of expectations is an abstract construct based on the discrepancy between expectations and perceptions, which has been previously described [17] and measured in multiple contexts [18–20]. Often also referred to as perceived quality (PQ) [20], its measurement is based on questionnaires including both expectations and perceptions of multiple attributes [21]. The importance of measuring PQ is justified because if expectations are greater than perceptions, then there is a disconfirmation of expectations, PQ is low and hence customer dissatisfaction occurs as predicted by the expectation-confirmation theory (ECT) [22].

Physiotherapy PMS are complex engineering products [23], whose concept and design are expected to be multi-dimensional. No validated measurement tool seems to currently exist, that assesses physiotherapists' PQ on physiotherapy PMS. The purposes of this study were to develop and validate an instrument to measure PQ or satisfaction of expectations on physiotherapy PMS, and to describe the PQ of the current PMS available. The following sections describe the development and measurement of the proposed scale, and the various steps involved. The questionnaire will be named the "Quality Questionnaire on Physiotherapy Practice Management Software" (QQPPMS).

2. Methods

The QQPPMS was developed in 3 phases from September 2021 to December 2022. In phase 1, the attributes relevant to physiotherapy PMS were identified in the literature review and focus groups with physiotherapists. In phase 2, several item pairs were developed, each item was recast into two statements: one to measure the expectations that PMS generates, and the other to measure the perceptions regarding their current PMS. The item pairs were then tested for clarity and relevance in a cognitive pretest with physiotherapists. In phase 3, a pilot study and psychometric testing was carried out for item reduction and to test the validity and reliability of the QQPPMS.

2.1. Phase 1: Identifying the attributes on PMS

A literature review followed by a qualitative study using focus groups with physiotherapists were performed to identify the attributes to be explored. For the data collection during the focus groups, videotape, audio, and field notes were used. The results of this phase are reported elsewhere. In summary, six domains of attributes grouped in two areas were identified: clinical care and administrative activities (Fig. 1).

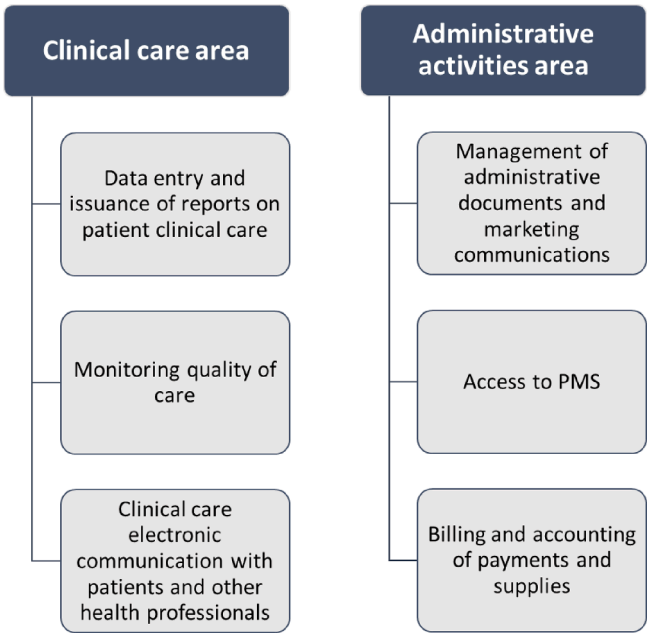


Fig. 1. Domains of attributes identified in the qualitative phase.

2.2. Phase 2: Development of the items and pretesting

The objective of this phase was to construct questions, based on applying the ECT to the identified attributes. An initial set of 43 item pairs was distributed among the six domains described above, 22 in the clinical care area and 21 in the administrative activities area. For the expectations, each area included an overall question that was phrased, "The desirable software for your center should allow (the following attributes) …" For the perceptions, each area included an overall question that was phrased, "The software you currently use in your center allows (the following attributes) …". A 7-point Likert scale was used for the responses, ranging from "very much disagree" to "very much agree". This design enabled the calculation of difference scores using the formula PQ = Expectations minus perceptions, where PQ is perceived quality and it is inversely proportional, that is, higher PQ values mean lower perceived quality.

The questionnaire was pretested for clarity and adequacy of content with 11 physiotherapists in 2 focus groups. Some questions were rephrased because they were leading to misunderstandings. The instrument finally distributed for evaluation comprised 43 item pairs.

2.3. Phase 3: Pilot study for item reduction and psychometric testing

The objective of this phase was to determine unidimensional PQ scales with reliability and validity. Psychometric testing of the questionnaire was carried out, surveying physiotherapists in the Valencian Community (Spain) during 6 months by completing the online questionnaire on LimeSurvey. The link to the questionnaire was distributed by the ICOFCV (Illustrious Official College of Physiotherapists of the Valencian Community) to all chartered physiotherapists via email, and posted on their corporate social networks with the pertinent explanations. Eligible participants were all graduated physiotherapists. The main interest was on those with experience with PMS in order to measure both, expectations and perceptions. Nevertheless, those without experience (n = 129) were not excluded because their expectations were of interest for item reduction. Furthermore, the accounting area was considered a different area from administrative activities area so that it would only be answered by physiotherapists with experience in this field. Reminders were also sent 1 and 3 months later. The answers were totally anonymous and a cookie was set to avoid repeated participations.

A sequential item reduction was carried out. First, item pairs where the expectation item was poorly understood, showed poor variability or poor correlation with other items in the same conceptual domain were eliminated. Thus, a total of 15 item pairs were eliminated. On the remaining 28 item pairs, those whose PQ score (expectations minus perceptions) showed poor variability or correlation were also eliminated. On the item pairs finally selected, unidimensional scales were identified and tested for validity and reliability.

2.4. Data analysis

The participants' socio-demographic and clinical characteristics were analyzed using descriptive statistics. A series of analyses were conducted to assess item reduction, factor structure of the questionnaire, and metric properties of multi-item scales for each of the three areas (clinical care, administrative activities and accounting). All analyses were performed with the SPSS statistical software program in its version 28.0.

For the second item reduction, item pairs with PQ score standard

deviation of less than 0.60 were removed to avoid items that showed poor variability. Exploratory factor analyses were performed to identify the item pairs responsible for the covariation of the data. Principal components analysis and varimax rotation were used for the initial factor extraction. Item pairs with loadings of 0.50 or higher were retained, but items with factor loading of higher than 0.40 on more than 1 factor were removed [21].

A correlation matrix of all items for each area and scale was used in a multi-trait scaling analysis to test the extent to which items converge with and diverge from the themes. A method of averages was used to score scales, summing up the scores of each item in the corresponding scale and dividing it by the number of items in that scale. Correlations between each item and its hypothesized scale were calculated and corrected for overlap by not including them in the scale.

For each scale, scaling success rates were computed as the percentage of items within the scale that correlated more highly or significantly more highly with the hypothesized scale than with the other themes. An item correlated significantly more highly with its own scale if the correlation between the item and its hypothesized scale was more than 2 standard errors higher than its correlation with other scales [22]. Moreover, the Cronbach alpha coefficient was calculated to test the internal consistency reliability for each scale, >0.7 was considered acceptable.

Construct validation was evaluated using known-group validity and defining 2 groups: a subgroup of participants who rated the overall perception of quality of their current software as "good" or "very good" and another subgroup that evaluated it as "very poor", "poor", or "regular". We hypothesized that the PQ scores (i.e., expectations minus perceptions) for all of the scales would be lower in participants with high evaluations of overall perception of quality than in those with poor overall perception of quality. A Student *t*-test was used to check the difference in the mean scale scores between these 2 groups. Also, the mean scores for the questionnaire responses across men and women were compared with a Student *t*-test for independent samples. Our hypothesis was that there would be no significant difference in the mean scores between these 2 groups.

3. Results

A total of 144 physiotherapists with experience in PMS completed the QQPPMS. The participation included a similar gender proportion, 13 years of experience in average, and a clear predominance of the private sector. 66 % of participants (95 physiotherapists) performed accounting duties (e.g., charging patients) at work. The participants' characteristics are shown in Table 1. Twenty-seven different PMS were identified in the survey, where the most common were I-Fisio, Clinic Cloud, Doctoralia Pro, MN Program, TIMP or Fisiosalus.

Table 1
Characteristics of participants.

Sex	Men	49 %
	Women	51 %
Age	<35	37.4 %
	35–50	54.4 %
	>50	8.2 %
	Others	33.3 %
Workplace	Physiotherapy clinic	76.3 %
	Hospital	4.4 %
	Primary health center	6.0 %
	Others	13.3 %
Job Position	Owner/Manager	41.5 %
	Employee in a private center	26.7 %
	Self-employed	23.7 %
	Employee in a public center	8.1 %
Years of experience	Average	13.3 years
Years working in that center	Average	8.6 years
Accounting duties at work		66.0 %
Number of PMS identified		27

3.1. Item reduction, structure of the questionnaire and metric properties

Four items were eliminated because they did not satisfy the cut-off criterion of a variance greater than 0.60. In the clinical care area, two items initially grouped in the domain "workflow coordination" and one item in the domain "monitoring quality of care" were eliminated. In the accounting area, 1 item in the scale "billing and accounting" was deleted for the same reason. Thus, for the exploratory factor analysis we had 11 items in the clinical care area, 9 in the administrative activities area, and 4 in the accounting area. Table 2 shows the items included in the factor analysis of each area.

Generally, the multi-trait scaling analysis supported the scaling of

Table 2
Factor analysis of the 9 items in the administrative activities area and the 4 items in the accounting area.

		Value for factor			
Scales	**Items**	**1**	**2**	**3**	**4**
Clinical care area					
Data entry and issuance of reports	Editable templates for assessment	0.866			
	Editable body charts	0.803			
	Templates for exercise programs and recommendations	0.801			
	Digitalized patient-reported outcome measures	0.784			
	Templates for patients' clinical reports	0.769			
Patient portal	Online appointment booking		0.883		
	Consult scheduled visits		0.854		
Digital Health Interventions (DHI)	Videoconference			0.901	
	Chat			0.823	
Monitoring quality of care	Healthcare activity reports				0.898
	Quality measures				0.749
Administrative activities area					
Issuance of routine documents	Templates for common documents	0.884			
	Automate the issuance of routine documents	0.877			
	Easily fill in and sign documents for patients and professionals	0.665			
Marketing strategies	Repository of standard messages		0.800		
	Allows mass mailings of communications		0.791		
	Links to external communication applications		0.712		
Data security	Saving and backup copies			0.841	
	Security measures against computer threats			0.776	
	Configuration of users and access permissions			0.701	
Accounting area*					
Billing and accounting	Fees configuration	0.955			
	Flexibility in the application of fees	0.926			
Control stock supplies	Stock reports		0.926		
	Notifications to replenish consumables		0.894		

* For this area, only physiotherapists with accounting duties at work have been considered (n = 95).

items into the hypothesized scales in the three areas (Table 3). In the clinical care area, the item-scale correlations ranged from 0.815 to 0.949, in the administrative activities area, the item-scale correlations ranged from 0.753 to 0.891, and in the accounting area, the item-scale correlations ranged from 0.940 to 0.973. In all areas, there was a percentage of scaling success of 100 % for all the scales. Their reliability was acceptable to excellent, with Cronbach alpha coefficients ranging from 0.733 to 0.943 (Table 3).

As expected, generally the mean scores of PQ between subgroups of participants with high evaluations of overall perception of quality and those who perceived overall quality to be poor differed significantly (Table 4). The difference in the mean scores of PQ ranged from 0.14 to 2.24 points, with lower PQ scores for the first group. As hypothesized, there was no significant difference in the PQ scale scores between men and women subgroups.

The final version of the QQPPMS consisted of 24 items of PQ on PMS, structured in 3 areas, which included 11, 9, and 4 items grouped into 4, 3, and 2 scales in clinical care, administrative activities, and accounting areas, respectively (see Appendix 1).

3.2. Description of perceived quality scores

Table 5 shows perceptions, expectations and PQ scores. While the expectations were high in most of the scales for the 3 areas (only "DHI" was lower than 5.30 out of 7), the perceptions were lower in the scales for the clinical care area (values lower than 3.30) than most of the rest of the scales (greater than 3.72 except for "Control stock supplies"). This means that the PQ scores for the clinical care area were higher (greater than 2.13) than most of the rest of the scales (four of the remaining five scales scored below 1.98), indicating a worse PQ in the clinical care area than in the other areas.

Figs. 2 and 3 show the distribution of the PQ scores reported in each one of the 24 items. In nine of the eleven clinical care area items, 50 % of the physiotherapists scored PQ $>$ 2.5, and in seven, 25 % of the physiotherapists scored a PQ $>$ 5. In contrast, in four of the nine items in the administrative area and in the two items of the "Billing and accounting" accounting area scale, 50 % of the physiotherapists scored a PQ equal or minor to 0. In addition, in the remaining five items from the administrative area 50 % of the physiotherapists scored the PQ $<$ 2.5.

4. Discussion

To the best of our knowledge, this is the first study to examine the PQ of physiotherapists towards PMS. For that purpose, we developed and validated an instrument according to the ECT, the QQPPMS. The questionnaire, which proved to be reliable and valid, was structured in three areas; clinical care, administrative activities, and accounting, with nine scales in total. In general terms, the PQ of the clinical care area was worse than the other two areas, where only the "control stock supplies" scale scored similar to the clinical care area scales.

QQPPMS was developed from a qualitative study in which 12 domains of attributes were identified. The content and number of domains identified in the QQPPMS was very similar, since QQPPMS was finally structured into 9 scales with 24 items. Only 2 domains were not integrated in the questionnaire (workflow coordination and interoperability), while 2 domains merged into 1 (data entry and issuance of reports). Therefore, it seems that our sequential selection of items was very efficient.

In multitrait scaling analysis, all scores had strong item-scale correlations, excellent item scaling success, and good internal consistency (Cronbach alpha coefficients of $>$0.7). Construct validity confirmed that those participants who had a high overall perception of quality for their PMS, scored better on the PQ for each of the scales than those who had a low overall perception of quality, except for patient portal and DHI. These two scales had similar scores between groups. Possibly, the high levels of inexperience with telerehabilitation tools (between 83 % and 95 % of physiotherapists do not use them) [15,24], explains why the group with high overall perception of quality continued to score a poor PQ for items on these scales.

While most of the attributes were expected by physiotherapists (i.e., showed a high mean in their expectations), those from the clinical care area and "control stock supplies" scale showed low perception scores, which translated into high PQ scores (i.e., poor PQ). In this sense, in 81 % of the clinical care area attributes half of the physiotherapists scored PQ $>$ 2.5, while in the other two areas, this only occurred in the "control stock supply" attributes. For example, in 55 % of the remaining attributes, half of the physiotherapists scored PQ $\leq\leq$ 0. These results would indicate that the support of current PMS for clinical care tasks leads to dissatisfaction among physiotherapists without reaching levels of satisfaction that justify their use for such purposes. This could be caused mainly because many of the software have been adapted from other health professions, especially medicine, so while administrative tasks may be common, those for clinical care purposes are more specific to each profession, especially those of telerehabilitation.

One of the main recommendations to increase the implementation of PMS in physiotherapy and improve the satisfaction of physiotherapists is to know their needs, incorporating the perspectives of end users in such software [11]. Thus, to the best of our knowledge, this is the first study to describe the PQ of physiotherapists on PMS attributes. Our findings have wide applicability and would suggest that while current PMS would satisfy physiotherapists for administrative activities, this is not the case for clinical tasks, so developers should reinforce the attributes of PMS for clinical tasks. In addition, we have developed and validated a questionnaire for this, which could be used as a model in other groups of physiotherapists from other regions.

Despite our novel contributions, this study is not without limitations. First, the study was carried out in the Spanish region of the Valencian Community and most of the participants were living or working in this region, so caution must be applied when trying to extrapolate the results. Second, as the recruitment method was mass mailings to physiotherapists, an optimal level of control over the sample was not obtained. Third, while the quality model defined by ISO/IEC 25010 determines the requirements to be taken into account to evaluate the properties of a given software product, this study, due to the particularities of PMS in physiotherapy, proposes its own model generated in different phases and determined by expectations and perceptions of the physiotherapists. Although aspects such as security are common in both models, future studies could evaluate the quality of PMS following the ISO/IEC 25010 standard.

Table 3
Summary of Results for Multitrait Scaling Analysis for the three areas.

Scale	Item-scale correlation range (Median)	% Scaling success	Cronbach alpha
Clinical Care area			
Data entry and issuance of reports	0.901–0.925 (0.913)	100	0.900
Patient portal	0.815–0.872 (0.845)	100	0.811
DHI	0.922–0.933 (0.927)	100	0.837
Monitoring quality of care	0.875–0.949 (0.911)	100	0.846
Administrative activities area			
Issuance of routine documents	0.823–0.891 (0.866)	100	0.829
Marketing strategies	0.753–0.859 (0.811)	100	0.742
Data security	0.760–0.843 (0.807)	100	0.733
Accounting area			
Billing and accounting	0.940–0.951 (0.945)	100	0.875
Control stock supplies	0.973–0.973 (0.973)	100	0.943

Table 4
Construct validity of scales*.

Scale	Overall perception of quality			Sex		
	Low	High	Mean differences (*p* value)	Men	Women	Mean differences (*p* value)
Clinical Care area						
Data entry and issuance of reports	3.26	2.35	0.91 (0.012)	3.03	2.67	0.36 (0.149)
Patient portal	2.70	2.13	0.57 (0.098)	2.65	1.91	0.74 (0.053)
Digital Health Interventions	2.25	2.11	0.14 (0.370)	2.26	2.15	0.11 (0.389)
Monitoring quality of care	2.50	1.64	0.86 (0.022)	2.02	2.18	−0.16 (0.336)
Administrative activities area						
Issuance of routine documents	2.90	0.66	2.24 (0.001)	1.94	1.47	0.47 (0.080)
Marketing strategies	2.48	1.60	0.88 (0.011)	2.18	1.76	0.42 (0.111)
Data security	2.21	0.92	1.28 (0.001)	1.35	1.37	−0.02 (0.472)
Accounting area						
Billing and accounting	2.62	0.64	1.88 (0.001)	1.63	1.42	0.25 (0.276)
Control stock supplies	3.28	2.20	1.08 (0.025)	2.75	2.62	0.15 (0.382)

* The values expressed are of perceived quality.

Table 5
Perceptions, expectations, and perceived quality scores for each scale by area.

Scale	Mean (SD)		
	PS	ES	PQ (ES-PS)
Clinical Care area			
Data entry and issuance of reports	3.23 (1.94)	6.09 (0.94)	2.86 (2.08)
Patient portal	3.05 (2.26)	5.34 (1.66)	2.29 (2.30)
DHI	2.58 (1.98)	4.79 (1.41)	2.21 (2.28)
Monitoring quality of care	3.37 (2.15)	5.30 (1.35)	2.13 (2.21)
Administrative activities area			
Issuance of routine documents	4.84 (1.98)	6.55 (0.78)	1.71 (1.99)
Marketing strategies	3.72 (2.04)	5.70 (1.17)	1.98 (2.07)
Data security	5.16 (1.71)	6.52 (0.77)	1.36 (1.77)
Accounting area			
Billing and accounting	4.92 (2.35)	6.27 (1.08)	1.35 (2.24)
Control stock supplies	3.19 (2.46)	5.88 (1.35)	2.69 (2.37)

SD: standard deviation; PS: Perception score; ES: Expectation score; PQ: perceived quality.

5. Conclusions

The measurement of the PQ helps to indirectly identify which attributes can make physiotherapists to be satisfied or dissatisfied with PMS. This, in turn, helps PMS developers to learn about possible attributes that should be reinforced and/or improved to increase the use of PMS by physiotherapists. Our study provides a valuable questionnaire of PQ towards the PMS attributes for clinical care, administrative activities, and accounting. The attributes related to clinical care and "control stock supplies" showed a worse PQ than the rest, whereas a high percentage of physiotherapists indicated a satisfactory PQ for administrative activities attributes. Therefore, this suggests that the clinical care functionalities should be improved to facilitate greater satisfaction with physiotherapy PMS.

CRediT authorship contribution statement

Eduardo Arza-Moncunill: Conceptualization, Data curation, Methodology, Writing – original draft. **Rodrigo Martín-San Agustín:** Conceptualization, Formal analysis, Visualization, Writing – original draft. **Francesc Medina-Mirapeix:** Conceptualization, Formal analysis, Writing – review & editing.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix

Appendix 1

"Quality Questionnaire on Physiotherapy Practice Management Software" (QQPPMS)
EXPECTATIONS ON THE ATTRIBUTES THAT THE DESIRABLE SOFTWARE FOR YOUR CENTER SHOULD OFFER
Please mark your degree of agreement/disagreement according to whether you consider each of the following attributes to be desirable or not.
Clinical care
THE DESIRABLE SOFTWARE FOR YOUR CENTER SHOULD ALLOW TO…
1 Access templates that define the anamnesis and examination of patients with specific pathologies
2 Access body map templates (or other similar tools) that can be used when assessing a patient
3 To Access therapeutic exercise templates (or guidelines) to select and customize a program to your patient.
4 Access questionnaires (e.g. VAS, NDI, DASH, SF-36) that can be used to measure the functionality of a patient
5 Access editable templates for issuing reports (e.g. clinical-legal, mutual insurance companies) to companies/clients on request
6 Your patients to book an appointment online
7 Your patients to consult online the dates of pending or completed visits
8 Make video calls with patients or other professionals

(*continued on next page*)

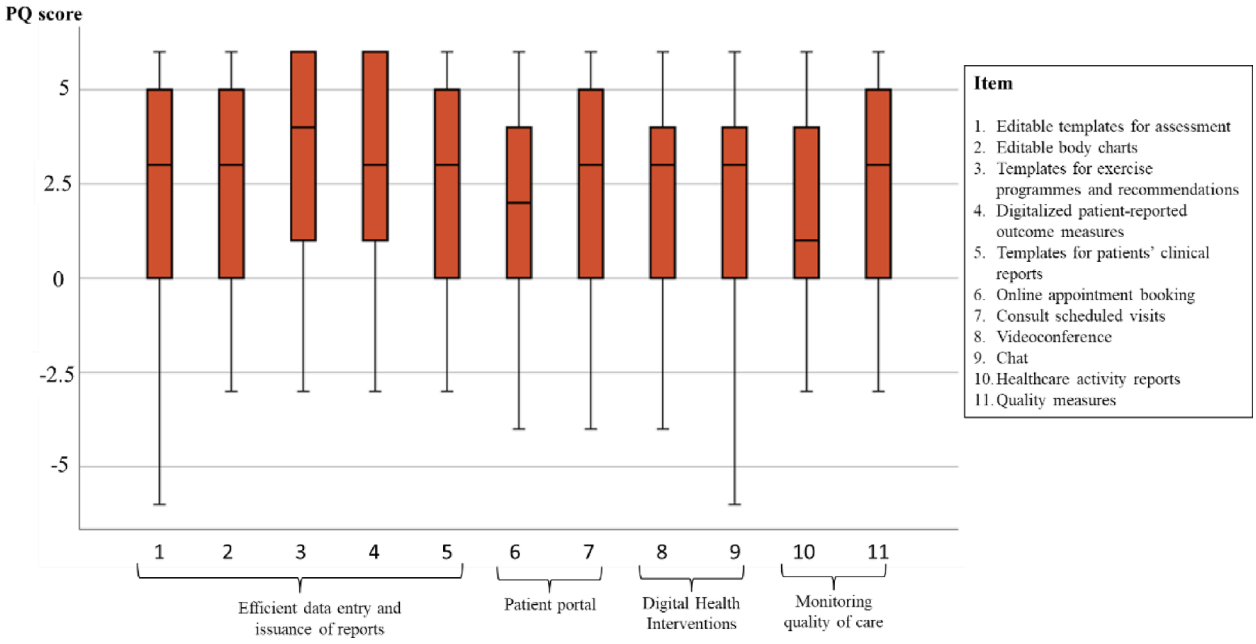


Fig. 2. Perceived quality scores of the 11 items in the clinical care area.

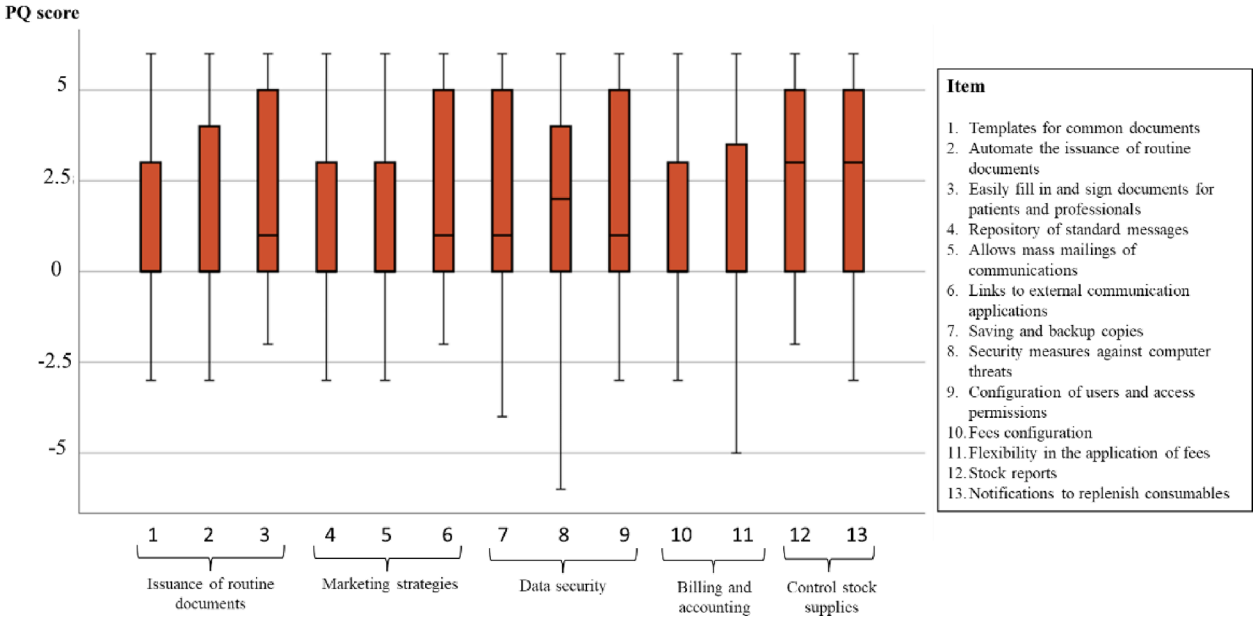


Fig. 3. Perceived quality scores of the 13 items in the administrative activities area (from 1 to 9) and accounting area (from 10 to 13).

(*continued*)

9 Chat with one or more patients
10 Periodically generate reports on the healthcare activity provided in the center (e.g. number of patients per pathology, number of sessions)
11 Periodically generate reports on the quality of healthcare provided at the center (e.g. results of satisfaction surveys)

Administrative activities
THE DESIRABLE SOFTWARE FOR YOUR CENTER SHOULD ALLOW TO…
12 Access invoicing templates or attendance proofs for issuing to companies/customers on request
13 Easily issue invoices, proofs or other common documents
14 Enable facility staff and patients to sign documents, consents or other authorizations (e.g. via Tablet)
15 Perform automatic backups and saves
16 Provide measures (e.g. anti-virus, encryption) against computer threats
17 Configure the software access permissions according to the profile of the employees
18 Access editable message templates to send to patients for a purpose (e.g. reminder, advertisement)

(*continued on next page*)

(*continued*)

19 Send mass communications (e.g. for advertising, promotions) to interest groups (runners, by gender, pathology)
20 Use external applications (e.g. WhatsApp, Telegram) to send messages to patients

Accounting
21 Enter all current fees at the center
22 Exceptionally apply flexible fees (e.g. for a discount)
23 Generate reports on the center stock of consumables (available, usual consumption)
24 Set up warnings to replenish some consumables (e.g. because your stock is low)

PERCEPTIONS ON THE ATTRIBUTES OFFERED BY THE CURRENT SOFTWARE IN YOUR CENTER

Mark your degree of agreement/disagreement according to whether or not you feel that the current software at your center allows each of the following attributes.
Clinical care
THE SOFTWARE YOU CURRENTLY USE IN YOUR CENTER* ALLOWS TO:
1 Access templates that define the anamnesis and examination of patients with specific pathologies
2 Access body map templates (or other similar tools) that can be used when assessing a patient
3 Access therapeutic exercise templates (or guidelines) to select and customize a program to your patient.
4 Access questionnaires (e.g. VAS, NDI, DASH, SF-36) that can be used to measure the functionality of a patient4
5 Access editable templates for issuing reports (e.g. clinical-legal, mutual insurance companies) to companies/clients on request
6 Your patients to book an appointment online
7 Your patients to consult online the dates of pending or completed visits
8 Make video calls with patients or other professionals
9 Chat with one or more patients
10 Periodically generate reports on the healthcare activity provided in the center (e.g. number of patients per pathology, number of sessions)
11 Periodically generate reports on the quality of healthcare provided at the center (e.g. results of satisfaction surveys)

Administrative activities
THE SOFTWARE YOU CURRENTLY USE IN YOUR CENTER* ALLOWS:
12 Access invoicing templates or attendance proofs for issuing to companies/customers on request
13 Easily issue invoices, proofs or other common documents
14 Enable facility staff and patients to sign documents, consents or other authorizations (e.g. via Tablet)
15 Perform automatic backups and saves
16 Provide measures (e.g. anti-virus, encryption) against computer threats
17 Configure the software access permissions according to the profile of the employees
18 Access editable message templates to send to patients for a purpose (e.g. reminder, advertisement)
19 Send mass communications (e.g. for advertising, promotions) to interest groups (runners, by gender, pathology)
20 Use external applications (e.g. WhatsApp, Telegram) to send messages to patients

Accounting
IF YOU HAVE EXPERIENCE WITH PATIENT CHARGES FILL IN THIS SECTION, OTHERWISE GO TO THE NEXT SECTION (by clicking NEXT below).
21 Have all current fees at the center integrated
22 Exceptionally apply flexible fees (e.g. for a discount)
23 Generate reports on the center's stock of consumables (available, usual consumption)
24 Set up warnings to replenish some consumables (e.g. because your stock is low)
The final items are presented in this table. The style, format and answer options are not reproduced here. For the scoring, a 7-point Likert scale was used, ranging from "Very much disagree" to "Very much agree".

Summary points

What was known on the topic

- Adoption and satisfaction of practice management software (PMS) in physiotherapy has been low and slow over time.
- Multiple recommendations have been proposed to increase physiotherapists positive attitudes and satisfaction with digital technologies.
- These recommendations mainly focus on the design of an adequate software to satisfy physiotherapists' expectations.
- Satisfaction of expectations or perceived quality is an abstract construct based on the discrepancy between expectations and perceptions.

What the study added to our knowledge

- No validated measurement tool seemed to currently exist, that assessed physiotherapists' perceived quality on physiotherapy PMS.
- The Quality Questionnaire on Physiotherapy Practice Management Software proved to be a reliable and valid questionnaire to assess the perceived quality on physiotherapy PMS.
- The knowledge of the perceived quality on the attributes of a PMS could help physiotherapists when benchmarking software solutions, and software developers to identify the attributes that need to be reinforced.

References

[1] Bonacina S, Koch S, Meneses I, Chronaki C. Can the European EHR Exchange Format Support Shared Decision Making and Citizen-Driven Health Science? In: Public Health and Informatics [Internet]. IOS Press; 2021 [cited 2023 Sep 30]. p. 1056–60. Available from: https://ebooks.iospress.nl/doi/10.3233/SHTI210346.

[2] Gagnon MP, Légaré F, Labrecque M, Frémont P, Pluye P, Gagnon J, et al. Interventions for promoting information and communication technologies adoption in healthcare professionals. Cochrane Effective Practice and Organisation of Care Group, editor. Cochrane Database Syst Rev [Internet]. 2009 Jan 21; Available from: https://doi.wiley.com/10.1002/14651858.CD006093.pub2.

[3] C.B. Peterson, C. Hamilton, P. Hasvold, From innovation to implementation: eHealth in the WHO European region, WHO Regional Office for Europe, Copenhagen, Denmark, 2016, p. 98.

[4] World Health Organization. Regional Office for Europe. Towards a roadmap for the digitalization of national health systems in Europe: expert meeting: Semmelweis University, Budapest, Hungary, 21 June 2018. 2018.

[5] Australian Physiotherapy Association (APA). Practice Management Software insight 2018. 2018.

[6] Canadian Physiotherapy Association, Physiotherapy Association of British Columbia. PABC EMR Toolkit: Implementing electronic medical records in private practice physiotherapy settings.

[7] Physical Therapy Software Market Analysis Report, 2022-2030 [Internet]. [cited 2023 Nov 15]. Available from: https://www.grandviewresearch.com/industry-analysis/physical-therapy-software-market-report.

[8] R. Buyl, M. Nyssen, From a paper-based to an electronic registry in physiotherapy, Stud Health Technol Inform. 141 (2008) 75–81.

[9] M.B. Michel-Verkerke, The love-hate relationship of physical therapists with electronic patient records, Procedia Comput Sci. 64 (2015) 432–441.

[10] Postolache G, Oliveira R, Postolache O. Designing Digital Tools for Physiotherapy. In: Brooks AL, Brooks E, editors. Interactivity, Game Creation, Design, Learning, and Innovation [Internet]. Cham: Springer International Publishing; 2017 [cited 2022 Dec 1]. p. 74–88. (Lecture Notes of the Institute for Computer Sciences, Social Informatics and Telecommunications Engineering; vol. 196). Available from: http://link.springer.com/10.1007/978-3-319-55834-9_9.

[11] D.J. Vreeman, S.L. Taggard, M.D. Rhine, T.W. Worrell, Evidence for electronic health record systems in physical therapy, Phys. Ther. 86 (3) (2006 Mar 1) 434–446.

[12] A. Yung, Adoption of electronic health record system in community-based physiotherapy clinics: a pilot case study, Build Capacity Health Inform Future (2017) 395–400.

[13] American Physical Therapy Association (APTA). Understanding and adopting Electronic Health Records (EHR). 2016.

[14] K. Estel, J. Scherer, H. Dahl, E. Wolber, N.D. Forsat, D.A. Back, Potential of digitalization within physiotherapy: a comparative survey, BMC Health Serv. Res. 22 (1) (2022 Apr 13) 496.

[15] A.K. Rausch, H. Baur, L. Reicherzer, M. Wirz, F. Keller, E. Opsommer, et al., Physiotherapists' use and perceptions of digital remote physiotherapy during COVID-19 lockdown in Switzerland: an online cross-sectional survey, Arch. Physiother. 7 (11) (2021 Jul) 18.

[16] L.D. Sulton, B. Hardisty, J. Bisterfeldt, R.F. Harvey, Computerized data bases: an integrated approach to monitoring quality of patient care, Arch. Phys. Med. Rehabil. 68 (12) (1987 Dec) 850–853.

[17] V.A. Zeithaml, L.L. Berry, A. Parasuraman, Communication and control processes in the delivery of service quality, J Mark. 52 (2) (1988 Apr) 35–48.

[18] A. Głuchowski, E. Czarniecka-Skubina, E. Kostyra, G. Wasiak-Zys, K. Bylinka, Sensory features, liking and emotions of consumers towards classical, molecular and note by note foods, Foods 10 (1) (2021 Jan 10) 133.

[19] Mensah O, Damoah O, Robert A. Assessing Farmers' Satisfaction of Agronomic Services Received in Ghana Using the SERVQUAL Model- a Case Study of Kumasi Metropolis. 2012;3(19):11.

[20] A.J. Verdú Jover, F.J. Lloréns Montes, M. del Fuentes Fuentes, Measuring perceptions of quality in food products: the case of red wine, Food Qual Prefer. 15 (5) (2004 Jul) 453–469.

[21] F. Medina-Mirapeix, M.E. del Baño-Aledo, J.J. Martínez-Payá, M.C. Lillo-Navarro, P. Escolar-Reina, Development and validity of the questionnaire of patients' experiences in postacute outpatient physical therapy settings, Phys. Ther. 95 (5) (2015 May 1) 767–777.

[22] A. Parasuraman, Alternative scales for measuring service quality: a comparative assessment based on psychometric and diagnostic criteria, J Retail. 70 (3) (1994) 201–230.

[23] Weber JH, Price M. Closing the gap: enacting knowledge transfer between engineering and use of healthcare software. In: Proceedings of the International Workshop on Software Engineering in Healthcare Systems [Internet]. Austin Texas: ACM; 2016 [cited 2023 Nov 14]. p. 19–25. Available from: https://dl.acm.org/doi/10.1145/2897683.2897692.

[24] A. Reynolds, N. Awan, P. Gallagher, Physiotherapists' perspective of telehealth during the Covid-19 pandemic, Int. J. Med. Inf. 1 (156) (2021 Dec) 104613.