

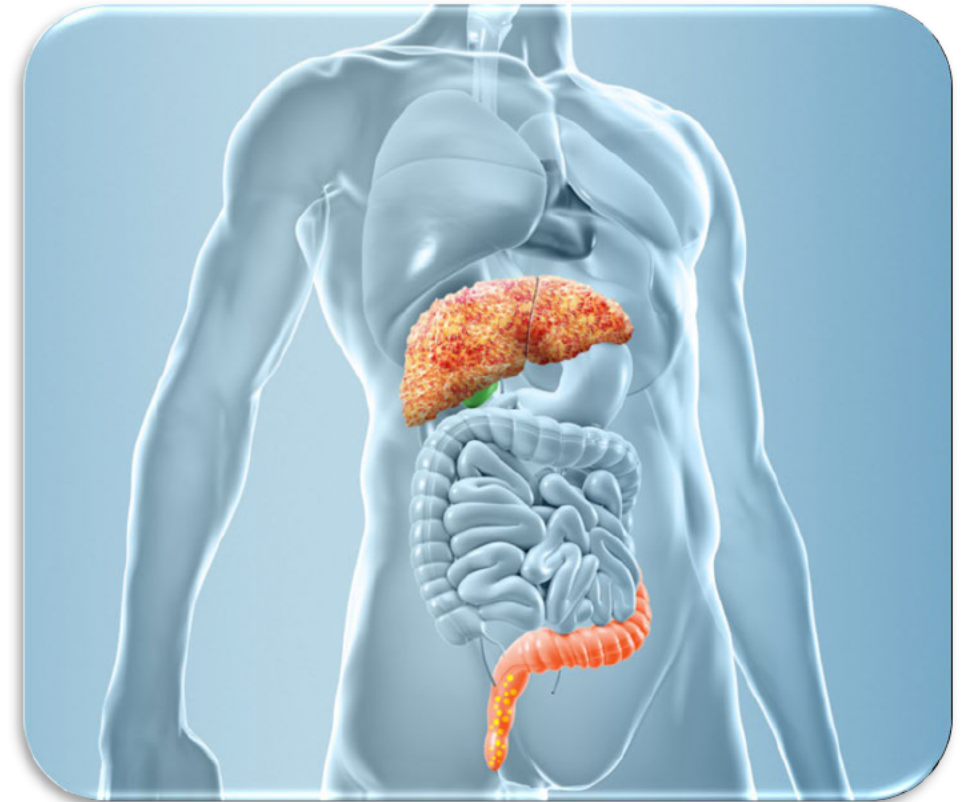
MICROB-PREDICT

Delphi “Oracle” – Decision Making in Science: Overview & Lessons Learned

Nina Donner
concentris

Robert Schierwagen
University of Muenster

MICROB-PREDICT 8th General Assembly Meeting,
Bellaterra, 28-30 September 2026



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Let's reach a consensus on a particular topic

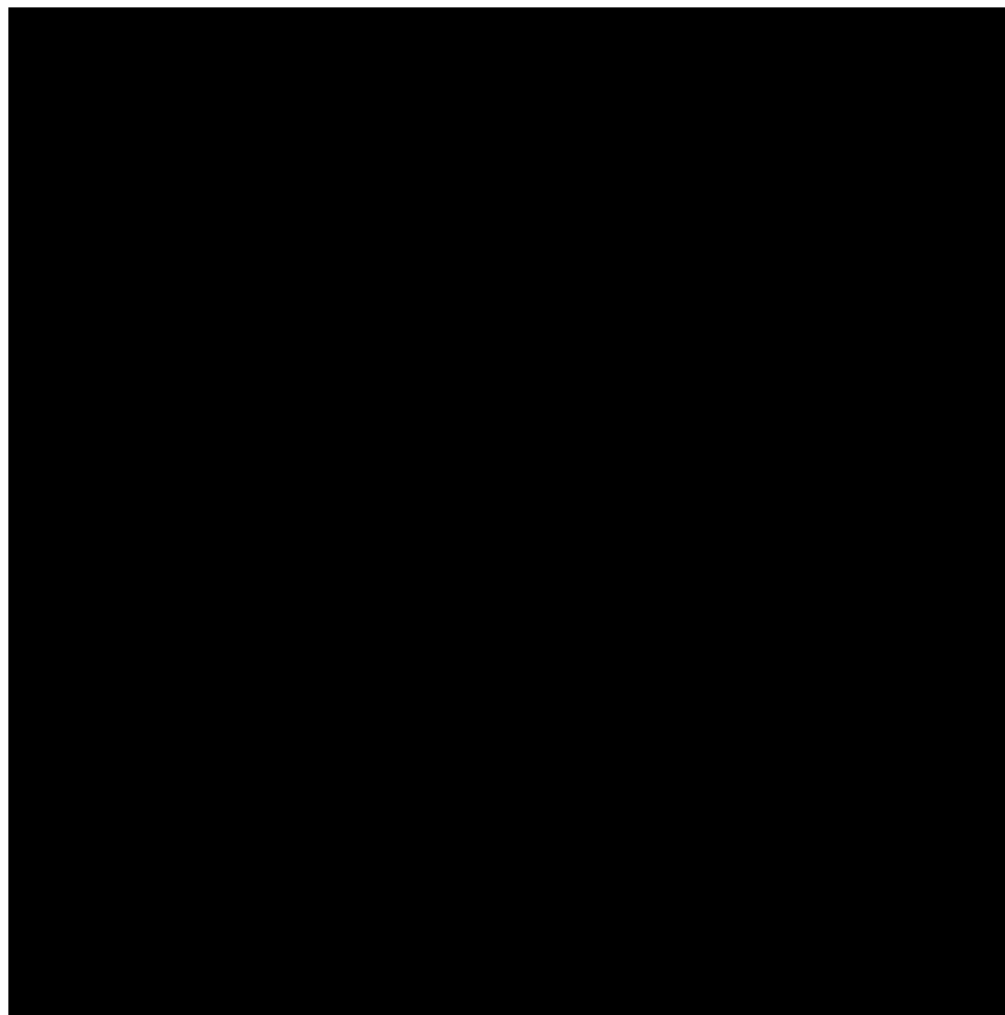


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The obvious problem: Five Experts, Six Opinions

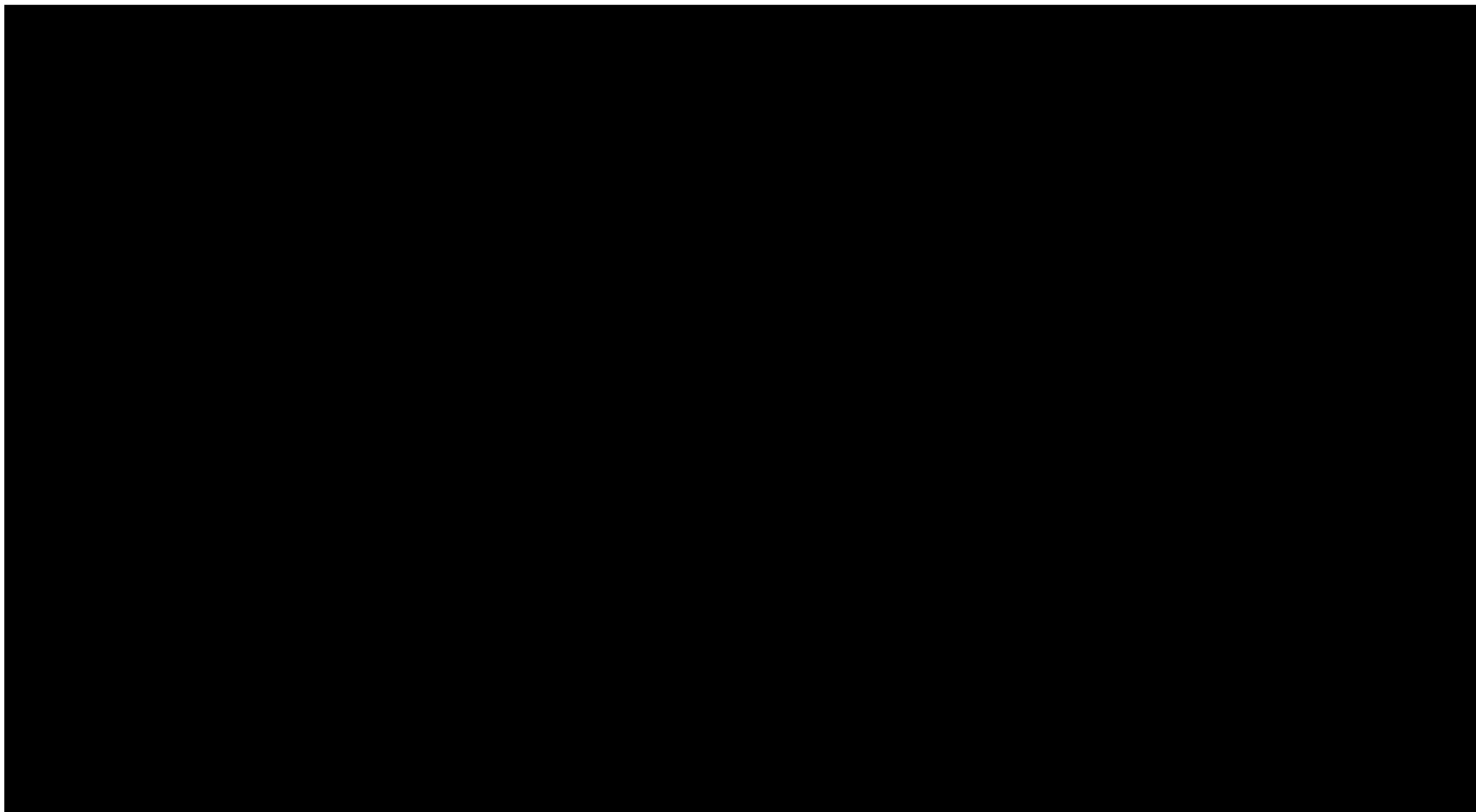


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How can we solve the problem?

Delphi Consensus

Tie together the collective wisdom of participants



Anonymity & Confidentiality



Quiet, thoughtful consideration



NO dominant personalities
NO group pressure
NO noise & side-tracking

*Images: Chat-GPT generated
& non-licensed open source
photographs*



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The Delphi Method – in Ancient Greece

*Powerful men asking
a female priest for an
„outcome prediction“
in times of
uncertainty before
making important
decisions*

*(starting wars &
political alliances...)*



*Image sources:
Wikipedia*

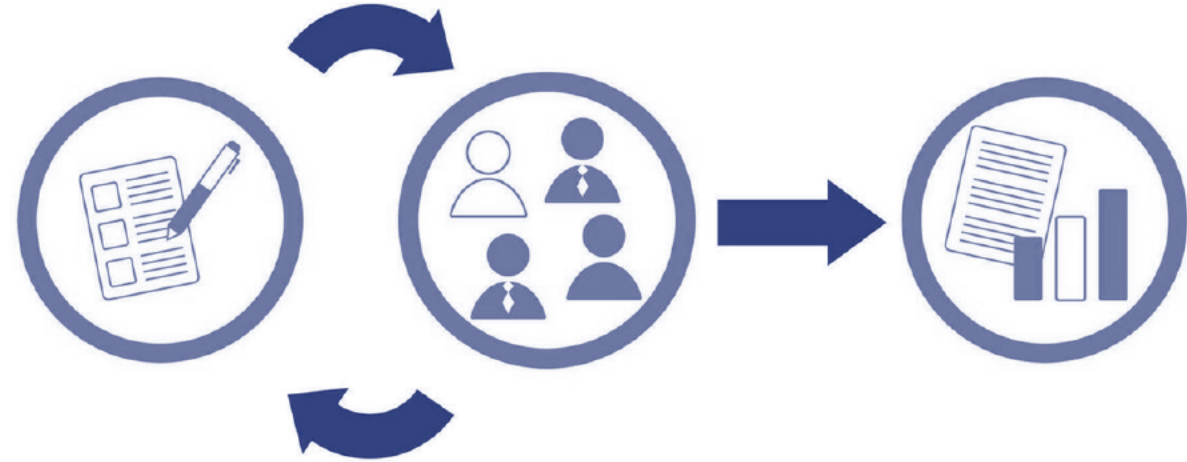


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Delphi Method – in Science

Scientists asking expert-level colleagues for a „scientific consensus“ on topics of uncertainty before writing an opinion paper, review paper, or policy brief

(for leveraging decision making in research, clinical practice, or policies)



The Delphi Method is a **research approach** used to **gain consensus** through a series of **rounds of surveys**, where information and results **are fed back** to **panel members** between each round.

I'd like to create a Delphi survey.

What are the first steps?

1. Define the scope and don't lose it
2. Provide structure & management
3. Literature review
4. Clear statements in form of „closed“ questions
5. Avoid ambiguity
6. Define outcome



I'd like to create a Delphi survey. Where do I start?

1. Define the scope and don't lose it



Kick off meeting with the team to define their objectives regarding the project

Example:

Microbiome-based mechanisms and biomarkers for improved patient stratification

&

Therapeutic response prediction in decompensated cirrhosis and ACLF

AGENDA

Microbiome-based mechanisms and biomarkers for improved patient stratification & therapeutic response prediction in decompensated cirrhosis and ACLF

Wednesday, 27 May 2026

15:30 – 18:30 h

Jansen Room



15:30 h	START OF THE CONSENSUS CONFERENCE (5 min) Welcome by the coordinator, Jonel Trebicka (UKM, Germany)
15:35 h	INTRODUCTION OF THEMES & TOPICS OF THE CONSENSUS CONFERENCE (10 min) Introduction by Minneke Coenraad (LUMC, The Netherlands)
15:45 h	THEME 1: PROGRESSION OF DECOMPENSATED CIRRHOSIS AND ACLF (55 min) 8 min presentations per topic + 10 min discussion for each topic: • Mechanisms of progression • Biomarkers of progression • Biomarkers of failure within the gut-liver axis
16:40 h	5 min COFFEE + BIO-BREAK
16:45 h	THEME 2: MECHANISMS AND BIOMARKERS OF THERAPEUTIC RESPONSE (55 min) 8 min presentations + 10 min discussion for each topic: • Albumin • Rifaximin • Tofipressin
17:40 h	5 min COFFEE + BIO-BREAK
17:45 h	WHAT LESSONS HAVE WE LEARNT FROM MICROBIOME RESEARCH IN THE FIELD OF DECOMPENSATED CIRRHOSIS AND ACLF ? (15 min) Summary by the coordinator, Jonel Trebicka (UKM, Germany)
18:00 h	SOCIALISING WITH CATERING (30 min) Continued informal discussions between the consortium and attending experts
18:30 h	END OF CONSENSUS CONFERENCE

Microbiome-based mechanisms and biomarkers for improved patient stratification and therapeutic response prediction in decompensated cirrhosis and ACLF

Welcome



**Wednesday,
27 May 2026
15:30 - 18:30 h
Jansen Room**



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I'd like to create a Delphi survey.

Where do I start?

1. Define the scope and don't lose it

6. Define outcome

Example:

1. *Consensus Conference in May 2026*
2. *Consensus Paper until September / October*



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I'd like to create a Delphi survey. Next step?

2. Provide structure & management

01_Information & Overview for Working Groups
02_Helpful Outcome Examples (of a Delphi Process)
03_Target Contacts for "Mini-Delphi" Questionnaire (by Steering Committee)
04_"Mini-Delphi" Questionnaire Setup (concentris)
05_Results of "Mini-Delphi" Questionnaire
06_Consensus Conference at EASL on 27 May 2026 (D9.9)
07_Consortium Manuscript (D9.12)
THEME 1 - PROGRESSION OF DECOMPENSATED CIRRHOSIS & ACLF
THEME 2 - MECHANISMS AND BIOMARKERS OF THERAPEUTIC RESPONSE
Literature Overview_incl. MICROB-PREDICT Publications
Paper_Tracking_MICROB-PREDICT
Working Groups - MICROB-PREDICT Consensus Conference



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Example:

*Working groups
(at least 8-12 experts)*

*Administrative support
(shared space, online meetings)*

*Structured work
(rules, e.g. number of questions
/ statements)*



AGENDA

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Microbiome-based mechanisms and biomarkers for improved patient stratification and therapeutic response prediction in decompensated cirrhosis and ACLF



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I'd like to create a Delphi survey.

Next step?

3. Literature review

Part B (full proposal)



Title of Proposal:
MICROBiome-based biomarkers to PREDICT decompensation of liver cirrhosis and treatment response (MICROB-PREDICT)

List of participants:

Participant No.	Participant organization name	Country
01 (CDO)	European Foundation For The Study of Chronic Liver Failure (EFCLIF)	Spain
02	Debrecen Ecosystem (University of Debrecen) (UNIDERB)	Hungary
03	Odense Universitetshospital (OUH)	Denmark
04	University of Copenhagen, Metabolic center (UCPH)	Denmark
05	European Molecular Biology Laboratory (EMBL)	Germany
06	Commissionariat à l'Énergie Atomique et aux Énergies Alternatives (CEA)	France
07	Max Planck Gesellschaft zur Förderung der Wissenschaften e.V. (MPG)	Germany
08 (SMF)	Vitomer (Vitomer)	France
09	Institut National De La Recherche Agronomique (INRA)	France
10	Karlsruhe University (KIT)	Germany
11	Universitätsklinikum Bonn (UKB)	Germany
12	Academisch Ziekenhuis Londen (LAZMC)	The Netherlands
13	Universitat de Barcelona (UB)	Spain
14 (SMF)	Bioeye Sciences GmbH (Bioeye)	Germany
15	Fundació Institut Català De Nanociència I Nanotecnologia (ICN2)	Spain
16	University College London (UCL)	United Kingdom
17	Universitet i Oslo (UiO)	Norway
18	European Liver Patients Association (ELPA)	Belgium
19 (SMF)	Consorcio de Investigación Biomédica en Enfermedades del Hígado (CIBEREH)	Spain
20	King's College London (KCL)	United Kingdom
21	Fundació Privada Clinic Per A La Recerca Biomèdica (FCRB)	Spain
22	European Association For The Study of the Liver (EASL)	Switzerland

Literature review



Kick off meeting with the team to define their objectives regarding the project

Kick off meeting with the Delphi Workgroup (DW) members

Video Conference meeting

NIH National Library of Medicine
National Center for Biotechnology Information

Log in

PubMed®

ACLIF mechanisms

Advanced Create alert Create RSS Search

Save Email Send to

Sort by: Best match

Display options

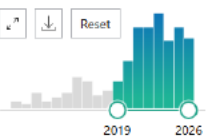
202 results

Page 1 of 21

MY CUSTOM FILTERS

Edit custom filters

RESULTS BY YEAR



PUBLICATION DATE

1 year

5 years

10 years

Custom Range

☐ Mechanisms and treatment approaches for ACLF.

1 Plano S, Mahmud N, Caraceni P, Tonon M, Mookerjee RP.
Liver Int. 2025 Mar;45(3):e15733. doi: 10.1111/liv.15733. Epub 2023 Sep 16.
PMID: 37715608 [Free PMC article](#). Review.

However, the selection of transplant candidates and their prioritization on the LT waiting list need standardization. Future challenges in the ACLF field include a better understanding of pathophysiological mechanisms leading to inflammation and organ failures. the ...

☐ Acute-on-chronic liver failure: Terminology, mechanisms and management.

2 BrVK, Sarin SK.
Clin Mol Hepatol. 2023 Jul;29(3):670-689. doi: 10.3350/cmh.2022.0103. Epub 2023 Mar 20.
PMID: 36938601 [Free PMC article](#). Review.

Scores like the Asian Pacific Association for the Study of the Liver (APASL) ACLF research consortium (AARC) score, a model for end stage liver disease (MELD), and the CLIF Consortium acute-on-chronic liver failure (CLIF-C ACLF) score can help in the prediction of m ...

Metabolomics in the development of ACLF

Quellen

+ Quellen hinzufügen

Im Web nach neuen Quellen suchen

Web Schnelle Recherche

Alle auswählen

1-s2.0-S016882782101895X-main.pdf

1-s2.0-S016882782305105X-main.pdf

1-s2.0-S0168827819306968-mainext.pdf

1-s2.0-S0168827820338216-main.pdf

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1-s2.0-S0168827823049917-main.pdf

1-s2.0-S0731708521001163-main.pdf

1-s2.0-S2468125325003280-main.pdf

253_2026_Article_13774.pdf

1872.full.pdf

Acute and non-acute decompensation of liver ci...

almed-2-4-almed-2021-0023.pdf

ANSA-2-536.pdf

Development and patterns of ACLF in patients w...

dysregulation_of_the.26.pdf

fcimb-11-573923.pdf

fcimb-16-1759738.pdf



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I'd like to create a Delphi survey.

Next step?

4. Clear statements in form of „closed“ questions

Example:

Basic science statement:

Impairment of the intestinal epithelial barrier and mucosal immune defense is a primary driver of microbial translocation in cirrhotic patients.

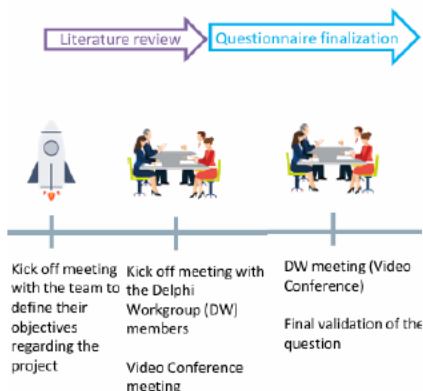
Clinical PICO:

In patients with decompensated cirrhosis (P), with or without prior hepatic encephalopathy, rifaximin (I) compared with placebo or standard of care alone (C) does not currently have sufficient evidence to support a reduction in overall liver-related mortality.



PICO =

Population/Patient/Problem,
Intervention,
Comparison/Control, and
Outcome.



I'd like to create a Delphi survey.

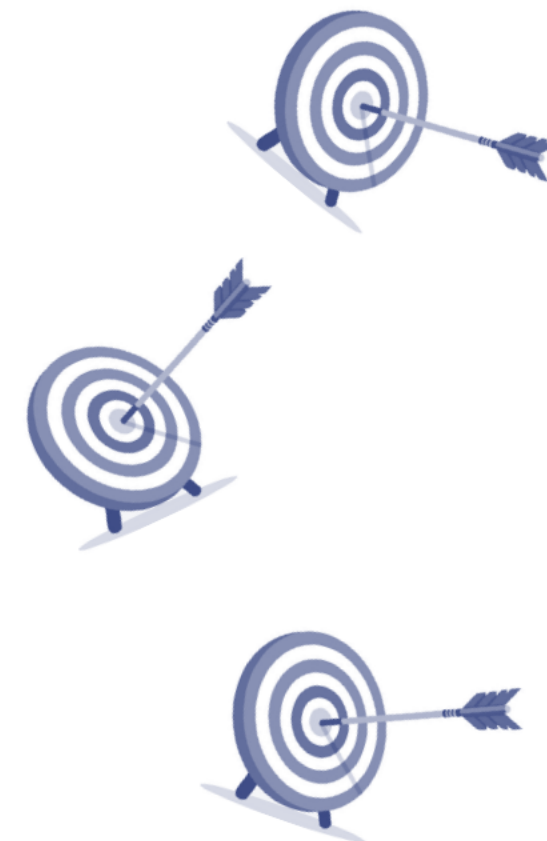
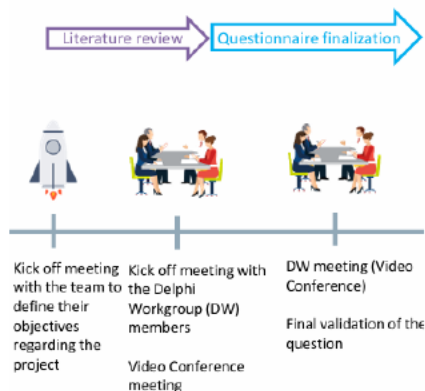
Next step?

5. Avoid ambiguity



Example:

*In adults with AD cirrhosis, especially those with AKI risk or evolving organ dysfunction (P), do urinary structural injury biomarkers such as **NGAL, IL-18, KIM-1, and urinary L-FABP (I)**, compared with **serum creatinine-based assessment and routine clinical scores alone (C)**, improve identification of **structural kidney injury, ACLF risk, or organ-failure progression (O)**.*



I'd like to create a Delphi survey.

Are we ready now?

1. Define the scope and don't lose it
2. Provide structure & management
3. Literature review
4. Clear statements in form of „closed“ questions
5. Avoid ambiguity
6. Define outcome



Almost....



I'd like to create a Delphi survey. What else do I need?

The right tool to perform the survey

**50 € (basic) - 275 € (full analysis support)
per month**

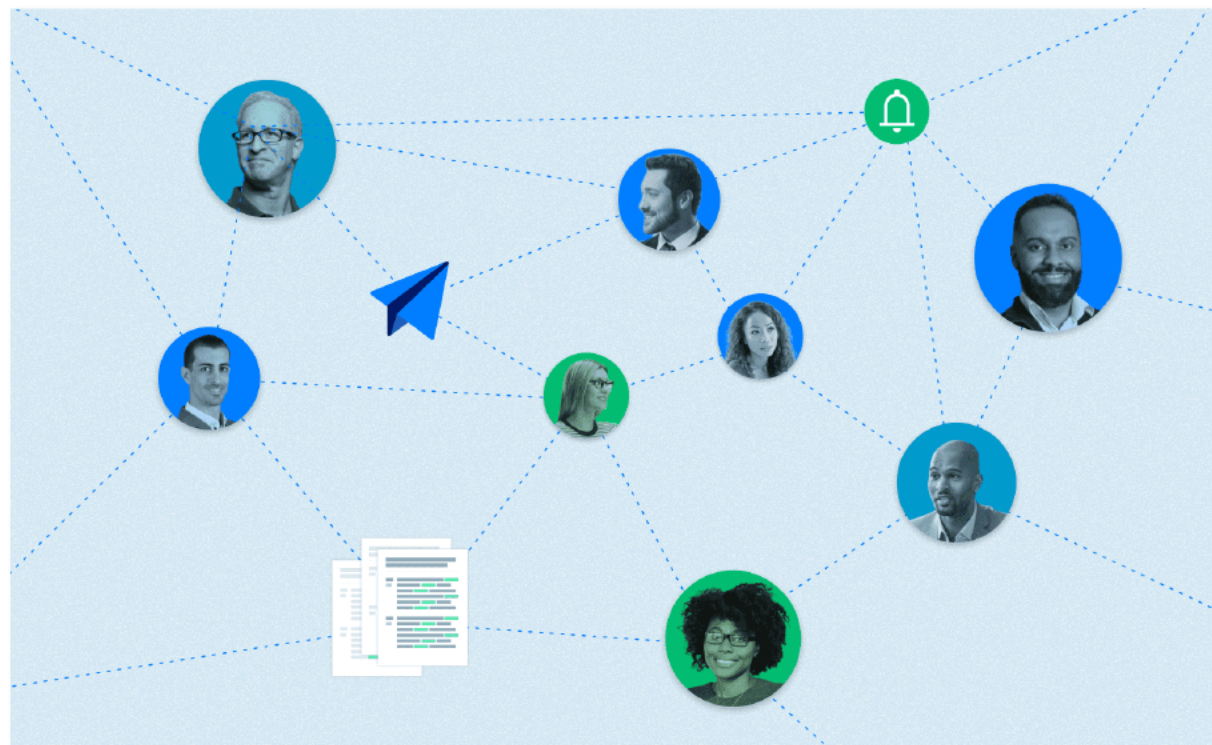
- GDPR compliance
- User-friendliness
- Sufficient number of participants allowed
- Built-in analysis support
- Costs

Feature / Platform	Qualtrics	REDCap	Alchemer	SurveyMonkey	Jotform	Typeform	Google Forms
Cost (general)	High	Low/Free	Mid	Mid	Low	Low	Free
Security & Compliance	Enterprise-grade GDPR/HIPAA	Strong (institutional)	Moderate	Moderate	Moderate	Basic	Basic
Advanced Logic	✓ Excellent	✓ Good	✓ Good	✓ Average	✓ Average	⚠ Basic	⚠ Basic
Delphi Workflow Support (multi-round / controlled feedback)	✓ Yes	✓ Yes	⚠	⚠	⚠	✗	✗
PDF Display / Embed	✓ Flexible	✓ (via HTML/link)	✓	⚠ Basic	✓	⚠ Link only	⚠ Link only
Participant Tracking / Tokens	✓ Yes	✓ Yes	✓ Some	✓ Some	✓ Some	✗	✗
File Upload (optional)	✓ Yes	✓ Yes	✓ Yes	✓ Yes	✓ Yes	✗	✓ Yes
Best For	Clinical/Delphi/secure research	Institutional research	Advanced logic w/ reporting	General surveys	Flexible forms w/ docs	UX-friendly forms	Simple, non-sensitive surveys



I'd like to create a Delphi survey. Who do I share the survey with?

Define and invite the expert panel



> **270 direct invitations via email**
+ open invitation via email (EASL + ELPA)
+ SoMe

	A	B	C	D	E	F
1	First name *	Last name*	Email*	Country	Institute Name / Acronym	Comment (e.g. specialty / expe
2	Sunje	Abraham	sabraham@alrijne.nl	Netherlands		
3	Eddie	Adams	eddie.adams@micronoma.com	USA		
4	James	Adams	jim.adams@asu.edu	USA		
5	Herve	Affagard	haffagard@maat-pharma.com	France		
6	Banwari	Agarwal	banwari.agarwal@nhs.net	UK		
7	Jessin Rashidi	Alavijeh	Jessin.Rashidi@uk-essen.de	Germany	University Hospital Essen	
8	Philipp	Althaus	PhilippStephan.Aldhaus@ukmuenster.de	Germany	University Hospital Muenster	
9	Carolina	Alves Costa Silva	Carolina.ALVES-COSTA-SILVA@gustaveroussy.fr	France		
10	Ashwin	Ananthakrishnan	ananthakrishnan@mgh.harvard.edu	USA		
11	Fabrizio	Andreelli	fabrizio.andreelli@aphp.fr	France		
12	Saba	Anwar	Saba.Anwar@nibisc.org			
13	Sanja	Arif	Sanja.Arif@ukmuenster.de	Germany	University Hospital Muenster	
14	Judith	Aron-Wisniewsky	judith.aron-wisniewsky@aphp.fr	France		
15	Mani	Arumugam	arumugam@sund.ku.dk	Denmark		
16	Paul	Ashwood	pashwood@ucdavis.edu	USA		
17	Bert	Baak	l.c.baak@olvg.nl	Netherlands		
18	Jasmohan	Bajaj	jasmohan.bajaj@vcuhealth.org	USA		
19	Adam	Baker	dkadb@chr-hansen.com			
20	Lulia	Balas	lulia.balas@yahoo.com			
21	Mapi	Ballester	mapibafe@gmail.com	Spain	Valencia	
22	Thomas	Berg	Thomas.Berg@medizin.uni-leipzig.de	Germany	University Hospital Leipzig	
23	Bernard	Berger	bernard.berger@rdi.nestle.com	Switzerland		
24	Dominik	Bettinger	dominik.bettinger@uniklinik-freiburg.de	Germany	University Hospital Freiburg	
25	Stephan	Bischoff	bischoff.stephan@uni-hohenheim.de	Germany	University Hohenheim	
26	Johannes	Bjork	bjork.johannes@gmail.com			
27	Ellen	Blaak	e.blaak@maastrichtuniversity.nl	Netherlands		
28	Herve	Blottiere	herve.blottiere@inrae.fr	France		
29	Ken	Blount	ken.blount@fering.com			
30	Marcus	Bohme	marcus.boehme@rdi.nestle.com	Switzerland		
31	Patrizia	Brigidi	patrizia.brigidi@unibo.it	Italy		

Contacts provided by Steering Committee Members



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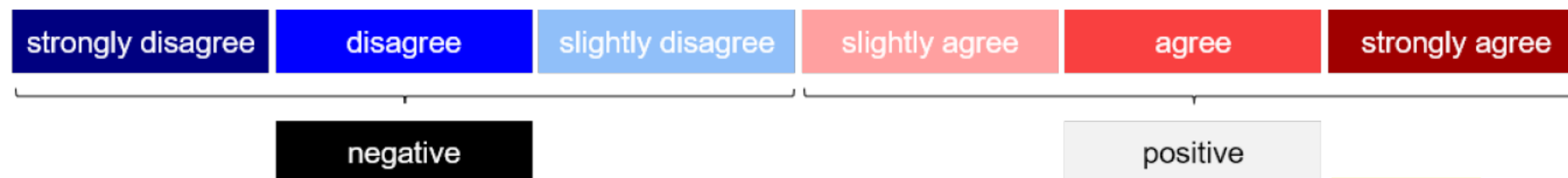
I'd like to create a Delphi survey.

Where do I set the cut-off value?

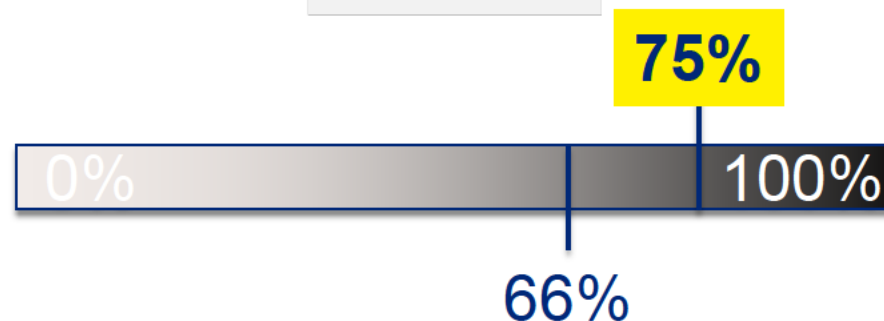
What is a Consensus?

- Indicates if the expert panelists agree with one another, not whether they agree or disagree with a statement.
- Example: If all experts disagree with a statement, this is also a consensus.
- Important: Avoid “middle-bias” entirely by using a smart Likert Scale.

Consensus level

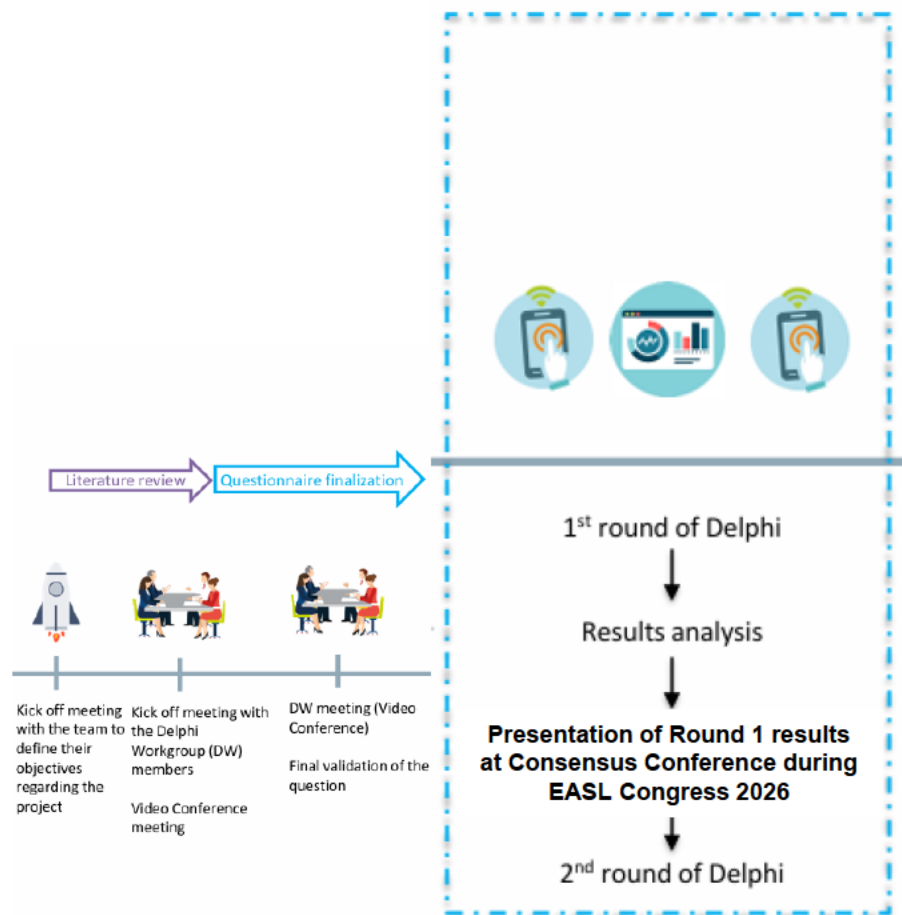


Statements that fail to reach consensus:
Eliminate or add to discussion



I have the survey results. What happens next?

Consensus process (Delphi)



Example:

26 of 31 Statements reached consensus in Round 1

Presentation of Round 1 Results during Consensus Conference at EASL Congress 2026

Live Vote on Revised Round 2 Statements during Consensus Conference failed due to low participation

Revised Round 2 Statements remained without consensus after Round 2 online survey (78% response rate)

AGENDA

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18:00 h	SOCIALISING WITH CATERING (30 min) Continued informal discussions between the consortium and attending experts
18:30 h	END OF CONSENSUS CONFERENCE



I have the survey results. What happens next?

After the Delphi survey Final analysis of results Develop recommendations

From 31 statements to 11 recommendations

Supplemental Table 1: Delphi survey statements or PICO questions and results. The detailed voting ratio is displayed below the summarized voting values. For negative consensus (totally disagree/disagree/slightly disagree) and for positive consensus (slightly agree/agree/totally agree).

Section 1 – Mechanisms of progression towards ACLF

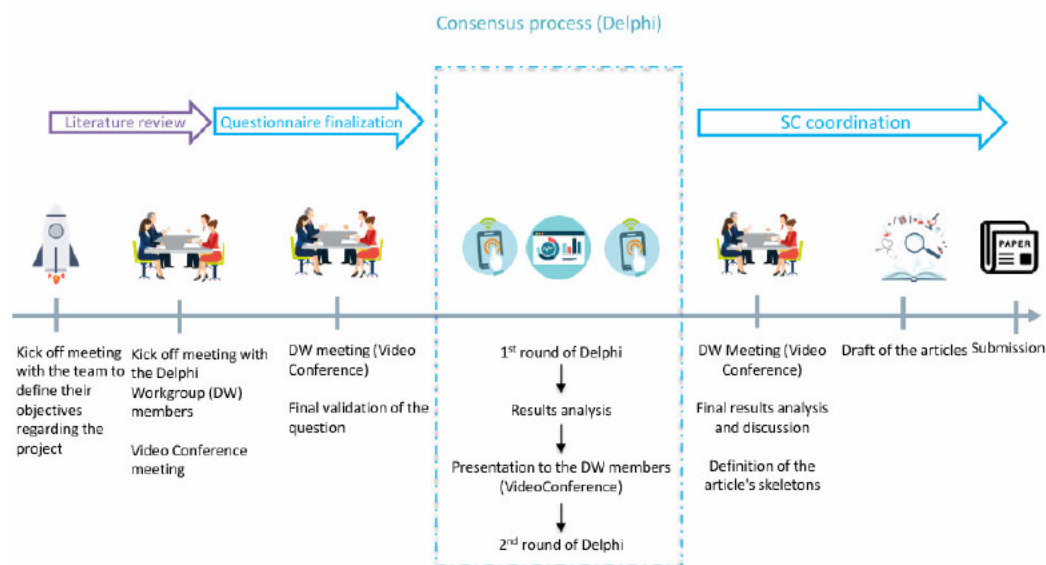
Statement	Consensus level	
	Negative Consensus % of replies (1-3)	Positive Consensus % of replies (4-6)
1.1 Impairment of the intestinal epithelial barrier and mucosal immune defences is a primary driver of microbial translocation in cirrhotic patients.	0.74 (0.00/0.00/0.74)	99.26 (5.15/45.59/48.53)
On a scale from 1 to 6, with 1 being 'strongly disagree' and 6 being 'strongly agree', experts voted.		

Statement	Consensus level	
	Negative Consensus % of replies (1-3)	Positive Consensus % of replies (4-6)
1.2 ACLF progression is driven by a PAMP/DAMP-mediated proteomic shift that shuts down hepatic synthesis while simultaneously triggering accelerated hepatic net interstitial collagen accumulation, signalling a transition to terminal organ failure.	11.20 (1.60/3.20/6.40)	88.80 (21.60/48.80/18.40)
On a scale from 1 to 6, with 1 being 'strongly disagree' and 6 being 'strongly agree', experts voted.		

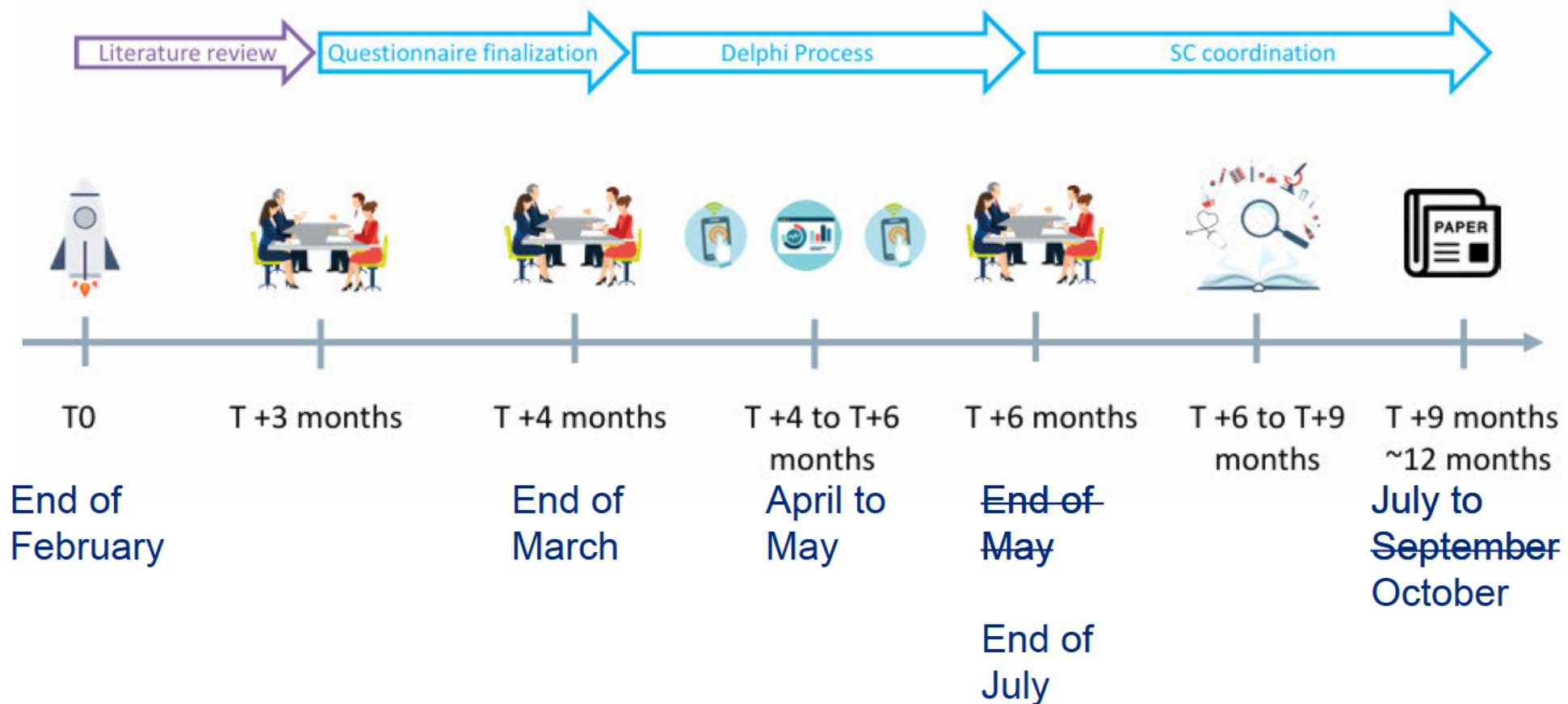
Statement	Consensus level	
	Negative Consensus % of replies (1-3)	Positive Consensus % of replies (4-6)
1.3 Microbial metabolites act as primary accelerators of the systemic inflammatory response rather than being a consequence of it.	10.69 (0.76/6.11/3.82)	89.31 (16.79/49.62/22.90)
On a scale from 1 to 6, with 1 being 'strongly disagree' and 6 being 'strongly agree', experts voted.		

Table 1: Recommendations for mechanisms and biomarkers of progression towards ACLF.

Recommendation	Specific actions	Related statements/PICOs
1. Establish intestinal barrier failure as an organ failure defining ACLF	Impairment of the intestinal epithelial barrier and mucosal immune defences are considered primary drivers of microbial translocation in cirrhosis and might be assessed by intestinal villin-1 (VIL-1), secretory immunoglobulin A or plasmalemmal vesicle-associated protein-1 (PV-1) in patients.	1.1, 3.1, 3.2, 3.3
2. Use multiple biomarkers to define gut barrier failure in AD cirrhosis	A single biomarker is not sufficient to define gut barrier failure in AD cirrhosis. A combined panel integrating gut barrier markers (see recommendation 1), systemic inflammatory markers, and established severity scores should be used.	3.4
3. Assess systemic inflammation for early diagnosis of infection, risk stratification, organ failure and clinical outcomes	ACLF progression is driven by a PAMP/DAMP-mediated proteomic shift, signalling a transition to terminal organ failure. The incorporation of immunosensory-based biomarkers – such as IL-6 or <i>IL-6</i> or lipid biomarkers – into standard clinical assessment should be considered for patients with AD, especially those with suspected infection or organ dysfunction. However, additional validation and simplification are needed for adoption in clinical routine.	1.2, 2.1, 2.2, 2.3, 2.5
4. Perform targeted metabolomics for improved monitoring and prediction of outcome	Microbial metabolites act as primary accelerators of the systemic inflammatory in ACLF progression. Assessment of metabolites improves the monitoring of patients and the prediction of their outcome. However, this approach needs to be simplified and made accessible for routine use.	1.3, 2.6
5. Consider inclusion of biological sex in clinical scores for risk stratification of ACLF progression and survival	Current prognostic scores for patients with acute decompensation or ACLF, such as CLIF-C and TAM, lack sex adjustments. Consideration should be given to incorporating biological sex as a factor in scoring systems used to predict the progression of ACLF and survival.	1.4
6. Enhance clinical prognostic scores through microbiome profiling	It should be investigated whether the introduction of supplementary profiling of the oral and gut microbiome, in combination with the measurement of circulating bacterial DNA, improves prediction of clinical outcomes and guide	R2-2.4



Congratulations! You've conducted a Delphi survey.



What could possibly go wrong?

Unclear scope or bad statements

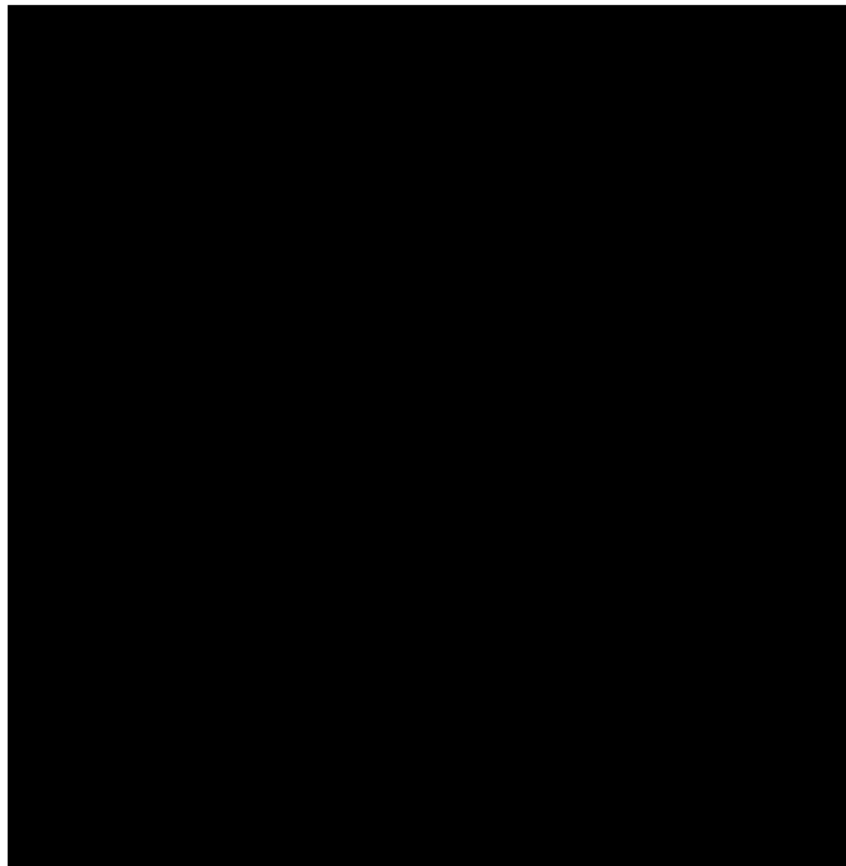


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The goal remains vague. “Let’s ask the experts” is not yet a research question.

Ambiguous or judgmental phrasing, as well as technical terms, remain unexplained.

The research team unconsciously influences the results through item selection, wording, and summarisation



Pretest with a small group: Check for clarity and completion time

Define terms & rules



What could possibly go wrong?

Lack of transparency

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Comments get lost, even though they contain explanations and new perspectives.

Changes made between rounds (items removed or merged) cannot be traced.

Methods and criteria are reported incompletely; results are overinterpreted.



Systematically analyse comments

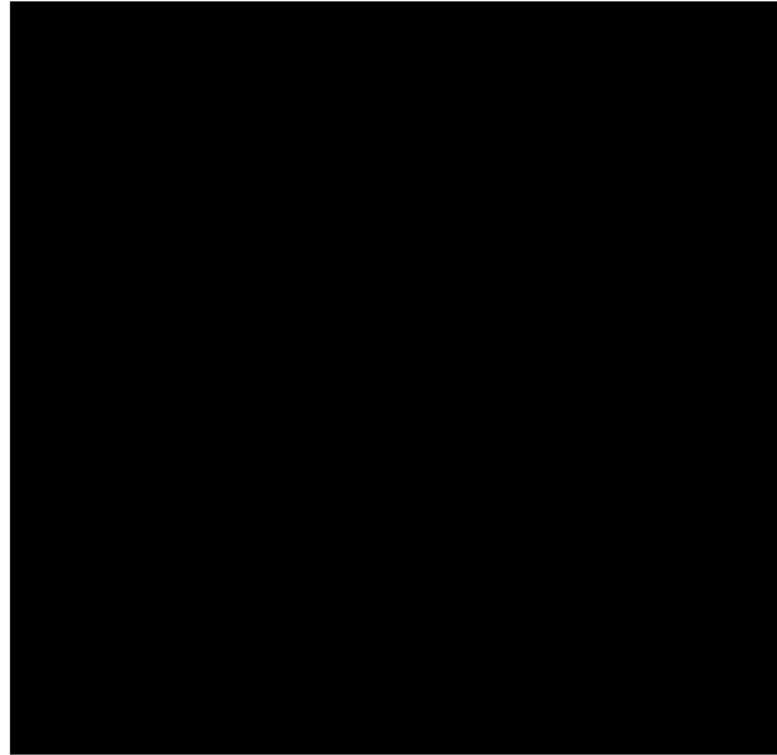
Identify limitations: Panel, Response Rate, Consensus Criterion, Lack of Representativeness



What could possibly go wrong?

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Wrong experts



The definition of “expert” is often vague.

Selection is based on name recognition or convenience, due to a lack of criteria.

A homogeneous panel might lead to blind spots



Define inclusion criteria in advance

Strategically combining perspectives

Multiple recruitment channels

Remember: Experts are NOT a random sample.

Does not allow conclusions about the general population.



What could possibly go wrong?

Panel fatigue

> 270 direct invitations + open invitation
via eMail and SoMe

1	2	3	4	5	6	7
First name	Last name	Email	Country	Institute Name / University	Comment	Drop, specialty / topic
1	Abraham	abraham@stjira.nl	Netherlands			
2	Adams	adams@stjira.nl	USA			
3	Adams	adams@stjira.nl	USA			
4	Adams	adams@stjira.nl	USA			
5	Adams	adams@stjira.nl	USA			
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29	Adams	adams@stjira.nl	USA			
30	Adams	adams@stjira.nl	USA			

Slow response times

High dropout rate over several rounds

Omissions are not random and can skew the results, when certain perspectives are left out



Base your sizing on the target, not on rules of thumb

Allow for a buffer for failures

Short questionnaires

Clear deadlines

Staggered reminders

A personal approach

137 participants in R1

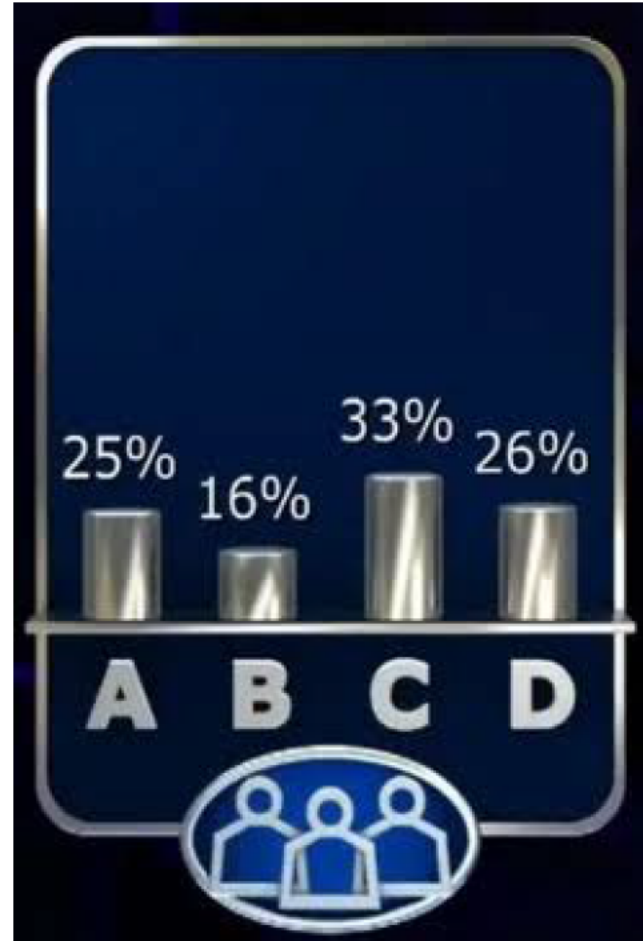
107 participants in R2
(78%)



What could possibly go wrong?

The “Who Wants to Be a Millionaire?” Dilemma

“Ask the Audience” Joker



You keep asking the experts until you get the answer that sounds most plausible - but in doing so, you completely ignore the fact that **experts can sometimes also be collectively wrong.**



Only time will tell



What could possibly go wrong?

Summary of Potential Pitfalls & Lessons Learned

- Unclear scope or bad statements
- Lack of transparency
- Wrong experts
- Panel fatigue
- The “Who Wants to Be a Millionaire?” dilemma
- **“Oracle of Delphi” irony**

The ancient Oracle of Delphi was famous for making **cryptic and vague predictions**, so that they always seemed to come true in one way or another.



Check for clarity



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Thank you for your attention!
What will be your next Delphi project?



Questions?

