

Supplementary material for

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Supplementary material 1: Search string in Medline (via Pubmed)

((Delirium[MeSH Major Topic]) OR (Deliri*[Title/Abstract])) AND ((Diagnosis[MeSH Terms]) OR (Outcome Assessment (Health Care) [MeSH Terms]) OR (Patient Outcome Assessment[MeSH Terms]) OR (Geriatric Assessment[MeSH Terms]) OR (Diagnostic[Title/Abstract]) OR (diagnostical[Title/Abstract]) OR (Diagnosis[Title/Abstract]) OR (Assessment[Title/Abstract]) OR (Assessing[Title/Abstract]) OR (Test[Title/Abstract]) OR (testing[Title/Abstract]) OR (Tests[Title/Abstract]) OR (Screen[Title/Abstract]) OR (screening[Title/Abstract]) OR (validation[Title/Abstract]) OR ("Delirium Detection"[Title/Abstract])) AND (("Aged"[Mesh]) OR ("Frail Elderly"[Mesh]) OR ("Older person*" [Title/Abstract]) OR ("Older adult*" [Title/Abstract]) OR ("Older patient*" [Title/Abstract]) OR (Elder* [Title/Abstract]) OR ("Geriatric patient" [Title/Abstract]) OR (Geriatric* [Title/Abstract])) AND (("Hospitals"[Mesh]) OR ("Inpatients"[Mesh]) OR ("Hospitalization"[Mesh]) OR Hospital OR Hospitali*) AND ((review[Filter] OR systematic review[Filter]) AND (english[Filter] OR german[Filter]) AND (aged[Filter] OR 80 and over[Filter])) AND ((review[Filter] OR systematic review[Filter]) AND (english[Filter] OR german[Filter]) AND (aged[Filter] OR 80andover[Filter]) AND (2001:2021[pdat]))

Supplementary material 2: Table S1

Table S1: Additional delirium detection tools							
Abbreviation (full name)	Target patient group / investigator (I)	Screening vs. monitoring Items	Scoring	Average duration	Psychometric properties	Reference	Critical appraisal
CAM (Confusion Assessment Method) „Family“							
bCAM (brief CAM)	ED patients ≥ 65 years (n = 406) + collateral history I: trained rater/physician	Screening 7 items on the 4 core features: 1. Acute onset or fluctuating course 2. Inattention 3. Disorganized thinking 4. Altered level of consciousness (RASS)	CAM algorithm: 1 + 2 + [3 or 4] positive = suspected delirium	< 5 min	Sens 0.78-0.84 Spec 0.96-0.97 RS: delirium diagnosis by psychiatrist based on DSM-IV criteria IRR: k=0.88	[21]	If no external information available and feature 2 + (3 or 4) positive, feature 1 is assumed positive

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CAM (long form)	Older patients ≥ 65 years (n = 56) + collateral history I: clinician or lay rater	Screening 10 items (4 items on core features (see bCAM) + 6 additional items)	CAM algorithm: 1 + 2 + [3 or 4] positive = suspected delirium	5-10 min	Sens 0.94-1.00 Spec 0.90-0.95 RS: Geriatric psychiatrist rating after comprehensive assessment IRR: presence/absence of delirium 100% k=1.0; rating all 10 clinical features 88% k=0.67; assessing 4 core features 93% k=0.81	[24]	Refers to most CAM tools: Professional training required; poor sensitivity when CAM is conducted by untrained/insufficiently trained raters
CAM-ED (Emergency Department)	ED patients ≥ 65 years (n = 35) + collateral history (medical records) I: clinician or lay rater	Screening 10 items, 5 of which are core features: 1. Acute onset 2. Fluctuating course 3. Inattention 4. Disorganized thinking 5. Non-alertness	Modified CAM algorithm: 1. + 2. + 3. + [4. or 5.] positive (4/4) = delirium [1 or 2] + 3 + [4 or 5] positive (3/4) = probable delirium 2/4 positive = possible delirium ≤ 1/4 positive = no delirium	5-10 min	No psychometric properties available (no validation study) CAM-ED delirium diagnosis (38 of 385 screened patients) compared to delirium diagnosis by ED physician's customary evaluation: only 6 of 35 included delirious patients = 17 %	[33]	Additionally MMSE required
CAM-S (long form)	Sample 1: Surgical patients ≥ 70 years (n = 300) Sample 2: General medicine patients ≥ 70 years (n = 919) + collateral history I: trained rater/clinician	Screening + severity scoring 10 items (4 items on core features (see bCAM) + 6 additional items) Acute onset or fluctuating course rated as absent (0) or present (1) Other 9 items rated as absent (0), mild (1) or marked (2)	CAM algorithm: 1 + 2 + [3 or 4] positive = suspected delirium Severity score 0-19, higher score = more severe delirium	10-15 min	IRR: ICC 0.88 Construct validity compared to Daily Confusion Rating r=0.80 in sample 1, r=0.64 in sample 2; compared to Brief Cognitive Screen r=0.72; compared to MMSE r=0.64 Predictive validity (Nursing home placement) RR=1.0, 1.4, 2.1, 2.5 RR=1.0, 1.4, 2.3, 3.9 across CAM-S long form severity levels, p-trend<0.001	[25]	Brief cognitive testing (e.g. SPMSQ) required
CAM-S (short form)	Surgical patients ≥ 70 years (n = 300) General medicine patients ≥ 70 years (n = 919) + collateral history I: trained rater/clinician	Screening + severity scoring 4 items on core features (see bCAM) Acute onset or fluctuating course rated as absent (0) or present (1) Other 3 items rated as absent (0), mild (1) or marked (2)	CAM algorithm: 1 + 2 + [3 or 4] positive = suspected delirium Severity score 0-7, higher score = more severe delirium	< 5 min	IRR: ICC 0.92 Construct validity compared to Daily Confusion Rating r=0.78 in sample 1, r=0.45 in sample 2; compared to Brief Cognitive Screen r=0.62; compared to MMSE r=0.41 Predictive validity (Nursing home placement) RR=1.0, 1.4, 2.1, 2.5 across CAM-S short form severity levels, p-trend<0.001	[25]	Brief cognitive testing (e.g. SPMSQ) required

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Abbreviation (full name)	Target patient group / investigator (I)	Screening vs. monitoring Items	Scoring	Average duration	Psychometric properties	Reference	Critical appraisal
I-CAM	Older patients ≥ 80 years with dementia (n = 102) + collateral history I: trained rater/clinician	Screening CAM adapted to ICD-10 classification: 4 items on core features (see bCAM) + 1 item on psychomotor activity	CAM algorithm: 1 + 2 + [3 or 4] positive = suspected delirium Suspected delirium + abnormal psychomotor activity = delirium Suspected delirium + normal psychomotor activity → 2. I-CAM assessment after 24 hours No suspected delirium + abnormal psychomotor activity → 2. I-CAM assessment after 24 hours	< 5 min	Psychomotor activity items added to all original CAM examinations: Sens 0.55, Spec 0.97, AUC 0.96 Psychomotor activity items added sequentially only to original CAM examinations with “No suspected delirium”-result: Sens 0.91, Spec 0.85, AUC 0.95 RS: delirium diagnosis by multidisciplinary consensus panel based on ICD-10 criteria	[60]	
NH-CAM (Nursing Home)	Nursing home residents (n = 35721) Patient observation I: nursing home staff	Screening 9 items on core features (see bCAM) Use of modified items/variables included in the MDS-RAI	CAM algorithm: 1 + 2 + [3 or 4] positive = suspected delirium 2-3 items positive (but no delirium according to CAM algorithm) = subsyndromal delirium level 2 1 item positive = subsyndromal delirium level 1	5 min	No comparison to RS, only comparison to other MDS-based methods of delirium diagnosis using the same variables but other scoring algorithms Predictive validity: NH-CAM delirium severity associated with mortality (HR 1.5-1.9) and rehospitalization (HR 1.1-1.3)	[10]	Use of MDS items as representatives of original CAM items partly imprecise (e.g. “mood decline over last 90 days as a proxy for “acute onset”) Information on HR only in abstract, not in fulltext
Other tools than CAM							
6-CIT (6-item Cognitive Impairment Test)	Patients ≥ 70 years (n = 470) I: trained rater	Screening 6 items	Score 0-28 Cut-offs: Overall: ≥ 9 = suspected delirium No dementia: ≥ 8 = suspected delirium Dementia: ≥ 12 = suspected delirium	< 5 min	Overall: AUC 0.88, Sens 0.90, Spec 0.63 No dementia: AUC 0.80, Sens 0.85, Spec 0.61 Dementia: AUC 0.67, Sens 0.81, Spec 0.31 RS: delirium diagnosis based on DRS-R-98	[47]	Instrument identical with OMC (Orientation Memory Concentration Test) Includes MOTYB
ALOC (Altered Level Of Consciousness)	General medicine patients ≥ 75 years (n = 201) I: trained physician/nurse	Screening 1 item	Lethargy, stupor, coma, or hypervigilance present = suspected delirium	< 1 min	All patients: Sens 0.19, Spec 0.99 Patients with dementia: Sens 0.14 Patients without dementia/with MCI: Sens 0.21	[14]	Clinical impression of consciousness is rated Poor sensitivity in contrast to RASS (very similar approach)

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Abbreviation (full name)	Target patient group / investigator (I)	Screening vs. monitoring Items	Scoring	Average duration	Psychometric properties	Reference	Critical appraisal
AMT (Abbreviated Mental Test)	Surgical patients ≥ 65 years (n = 100) I: trained (lay) rater	Screening + Monitoring of POD (postoperative delirium) Preoperative AMT score required for comparison of results 10 items	Deterioration of ≥ 2 compared to preoperative score result = suspected delirium	< 5 min	Sens 0.93 Spec 0.84 RS: DAS (DSM-III criteria)	[44] [35]	AMT as a single tool only investigated in surgical patients, "pre-delirious" AMT score required for comparison of test results AMT is able to detect cognitive deficits, not delirium-typical characteristics
AMT-4	Acute stroke unit patients, median age 74 years (n = 111) I: trained rater (medical student)	Screening 4 items	Score 0-4 Cut-off: < 4 = suspected delirium	< 2 min	Sens 0.83 Spec 0.61 RS: CAM	[30]	AMT-4 (like AMT) as a single tool is able to detect cognitive deficits, not delirium-typical characteristics
CAC-A (Clinical Assessment of Confusion - A)	Adult medical/surgical patients (n = 129) + collateral history I: trained lay rater/nurse	Screening Tool 25 items	Score 0-77 Severity scoring included Cut-offs: 2-8 possible acute confusion 9-14 mild acute confusion 15-28 moderate acute confusion > 28 severe acute confusion	5 min	Correlated with level of confusion from VAS-C; RS: none PPV: 0.65 NPV: 0.79 IRR: r=0.88	[67]	Additionally MMSE and/or evaluation by psychogeriatric nurse recommended
CAC-B (Clinical Assessment of Confusion - B)	Adult medical/surgical patients (n = 149) + collateral history I: trained lay rater/nurse	Screening Tool 58 items	Severity scoring included Cut-offs: 66-80 possible acute confusion 81-100 mild acute confusion 101-120 moderate acute confusion > 120 severe acute confusion	10 min	Correlated with level of confusion from VAS-C; RS: none Content Validity index: 0.88 Reliability: Cronbach's alpha = 0.95 IRR: r=0.69	[16]	No access to reference Additionally MMSE and/or evaluation by psychogeriatric nurse recommended
CCS/ADS (Communication Capacity Scale/Agitation Distress Scale)	Palliative patients (n = 30) + collateral history I: nurse/clinical staff	Monitoring Tool CCS 5: 5 items ADS 6: 6 items	CCS 5: Score 0-17 ADS 6: Score 0-18 No cut-offs defined, higher scores indicate higher severity levels	5-10 min	IRR: Cronbach's alpha coefficients = 0.91 CCS, 0.96 ADS Validity: CCS compared to MDAS rho=0.78; compared to Sedation Scale rho=0.86; cognitive items on the MDAS and DRS rho=0.83; ADS compared to DRS rho=0.61; compared to agitation items on MDAS and DRS rho=0.61	[41]	Does not cover all aspects of delirium, not appropriate for screening

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CDT (Clock Drawing Test)	ED patients ≥ 65 years (n = 406) I: trained rater	Screening Three methods: Clinical gestalt CAMDEX version (Score 0-3) Shulman version (Score 0-5)	Clinical gestalt: normal/abnormal CAMDEX: 0 = no clock face drawn, 3 = perfect clock Shulman: 0 = no clock face drawn, 5 = perfect clock	< 5 min	Abnormal gestalt: Sens 0.94-0.96, Spec 0.40-0.44 CAMDEX < 3: Sens 0.94-0.96, Spec 0.40-0.41 Shulman < 5: Sens 1.00, Spec 0.20-0.25 RS: delirium diagnosis by psychiatrist based on DSM-IV criteria	[11]	Unsuitable tool for delirium detection
	Older patients ≥ 70 years (n = 59)	Screening Score 1-10 (Fisher/Flowerdew version)	Higher score = more accurate performance		No significant effect of DRS (p=0.711), CAM positive (p=0.969) or CAM negative (p=0.568) on CDT score Significant effect of MMSE (p<0.0001) on CDT score	[2]	
CHART-DEL (Chart Review on Delirium)	Geriatric patients (n = 919) Chart review I: trained clinical staff	Screening + Monitoring Related to the CAM core features 7 items	Delirium diagnosis classification depending on recorded core symptoms: definite, probable, possible, uncertain	15-30 min	Sens 0.74 Spec: 0.83 RS: trained interviewer ratings for delirium based on the CAM IRR: k=0.41	[26]	Potential misclassification Not recommended for diagnostic purposes
Cog-4 (Cognitive status - 4)	Acute stroke unit patients, median age 74 years (n = 111) I: trained rater (medical student)	Screening 4 items on consciousness (orientation, executive function), language, inattention	Score 0-9 Cut-off: > 0 = suspected delirium	< 3 min	Sens 0.70 Spec: 0.44 RS: CAM	[30]	Subset of the National Institute of Health Stroke Scale (NIHSS) Poor specificity for delirium detection
CRS (Confusion Rating Scale)	Older hip fracture patients (n = 169) / nurse (who observed patient) I: trained lay rater or clinician	Screening tool Severity scoring included 4 items	Score 0-8 (for each item 0=absent, 1=mild, 2=severe) Cut-off > 0 (= evidence of confusion)	1-2 min	RS: None IRR: 86.5% Agreement with SPMSQ: 78-79%	[69]	The authors themselves label the test as "immature" Has been further developed into the Nu-DESC
CSE (Confusional State Examination)	Older patients (n = 71) + collateral history I: trained clinical staff	Monitoring Severity scoring included 22 items: confusion score (12 items), associated symptoms (7 items), intensity and duration (3 items)	Each item scored 0-4 Confusion score: < 25 = mild delirium 25-35 = moderate delirium > 35 severe delirium	< 30 min	IRR (confusion score): Spearman rank order correlation coefficient 0.89; weighted kappa coefficient 0.58 Sens to change: Correlation of change in confusion score over three weeks of pharmacological treatment to change in Clinical Global Impression scale for Improvement r=0.75	[52]	Not suitable for delirium screening or diagnosis

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CTD (Cognitive test for Delirium)	ICU patients (n = 103) I: trained lay rater or clinician	Screening tool, two alternate forms (A and B) 9 items	Score 0-30 Cut-off ≤ 18	10-15 min	IRR: coefficient alpha=0.87 High correlation with MMSE in patients with delirium (0.82) and dementia (0.81) Sens 1.0 Spec 0.95 RS: delirium diagnosis by psychiatrist based on DSM-III-R criteria	[22]	Test cannot reliably distinguish delirium from severe dementia
DAS (Delirium Assessment Scale)	Older patients (n = 60 or 48, unclear) + collateral history (staff) I: physician	Monitoring Severity scoring included 10 items	Score 0-26	< 10 min	IRR: 0.66-0.99 Sens / Spec 0.80-0.90 RS: delirium diagnosis by geriatrician based on DSM-III criteria	[45]	Test may be suitable for monitoring delirium severity Not able to differentiate delirium from dementia
DCT2 (timed Digit Cancellation Test)	Geriatric patients (n = 110) I: physician	Screening	Within a time-limit of 45 seconds the patient has to cross out two predefined numbers on a matrix with 110 numbers from 0-9 (totally 20/110, 1 point per match, minus 0.22 points for every error) Cut-off < 9 (cognitively impaired patients: < 8)	5 min	All patients (cut-off < 9): Sens 0.94, Spec 0.87 Cognitively impaired patients (cut-off < 8): Sens 0.78, Spec 0.76 RS: delirium diagnosis by geriatrician based on DSM-III-R criteria	[56] [46]	Good vision required
DDS (Delirium Detection Score)	ICU patients (n = 1073) I: clinical staff	Screening + monitoring Severity scoring included	Score 0-56	10 min	Sens 0.69 Spec 0.75 RS: Ramsay Sedation Scale (RSS), Sedation Agitation Scale (SAS), clinical assessment IRR: physician-physician 0.74 physician-nurse 0.76 nurse-nurse 0.64	[49]	Modified from Clinical Withdrawal Assessment for Alcohol – revised (CIWA-Ar) Low sensitivity and specificity Sedation scales and “clinical assessment” (no details) as RS

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DDT-Pro (Delirium Diagnostic Tool-provisional)	Kean: Adult patients with acquired brain damage (n = 36) Franco: Internal medicine patients ≥ 60 years (n = 200) + collateral history I: trained lay rater or clinician	Screening tool 3 items	Score 0-9 Cut-off 7 (< 7 = suspected delirium, ≥ 7 = no delirium)	5 min	Kean: Sens 1.0, Spec 0.94 Franco: Sens 0.88-0.90, Spec 0.81-0.85 RS: delirium diagnosis by psychiatrist based on DSM-5 criteria and DRS-R-98	[29] [15]	According to authors (Franco et al.) "further validation warranted before widespread use can be recommended"
DelApp (Delirium App)	Geriatric and orthopedic patients ≥ 70 years (n = 156) I: trained psychologist	Screening + Monitoring Arousal assessment (patient awake and able to follow commands?), followed by attention task (counting stars on smartphone display while distracting triangle shapes appear around stars)	Score 0-10 (Arousal assessment 0-4, attention task 0-6) Cut-off: ≤ 8 = suspected delirium	< 5 min	All patients: Sens 0.98, Spec 0.93 (cut-off ≤ 8) Delirium vs. dementia: Sens 0.98, Spec 0.87 (cut-off ≤ 8) RS: delirium diagnosis based on CAM and DRS-R-98	[61]	Second study shows poorer sensitivity and specificity According to authors further studies needed
	General/acute medical hospital patients ≥ 65 years (n = 187) I: trained psychologist				All patients: Sens 0.92, Spec 0.74 (cut-off ≤ 8) Delirium vs. dementia: Sens 0.92, Spec 0.52 (cut-off ≤ 8) Sens 0.82, Spec 0.68 (cut-off ≤ 6) RS: neuropsychological test battery based on DSM-5 criteria	[62]	
DI (Delirium Index)	Older adults ≥ 65 years (n = 318) I: trained lay rater or clinician	Severity scoring tool 7 items	Score 0-21 (higher score = higher severity of delirium)	10 min	IRR: ICC 0.98 Convergent validity compared to MMSE: Spearman correlation coefficient delirium and dementia patients -0.83 delirium patients only -0.79 dementia patients only -0.78 neither delirium nor dementia -0.66	[36]	Has to be combined with MMSE (at least questions 1-5) or other cognition test Suitable for scoring and monitoring of delirium severity, not for delirium screening

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Abbreviation (full name)	Target patient group / investigator (I)	Screening vs. monitoring Items	Scoring	Average duration	Psychometric properties	Reference	Critical appraisal
DMSS (Delirium Motor Subtype Scale)	Meagher: Palliative patients (n = 152) Grover: Adult psychiatric patients (n = 160) Garcia Nuñez: Surgical ICU patients (n = 289) I: trained clinical staff	Identification of motor subtypes (hyperactive, hypoactive, mixed, no motor subtype) Two versions with 11 items (Meagher 2008) / 13 items (Grover 2013): 4 (5) items for hyperactivity, 7 (8) items for hypoactivity	Cut-off: 2 "positive" items (hypoactivity: at least one of "decreased amount of activity" or "decreased speed of actions")	10 min	DMSS-German (Garcia Nuñez): IRR: Fleiss κ = 0.83 Motor subtypes (hyperactive, hypoactive, or mixed): Sens 0.60-0.97 No motor subtype: Sens 0.22 Spec for all individual subtypes 0.82-1.00 RS: delirium diagnosis by psychiatrist based on DSM-IV criteria and DRS-R-98	[38] [19] [17]	Not for delirium screening or monitoring, only suitable for determination of motor subtype
DMSS-4	Palliative patients, adult psychiatric patients (n = 487) I: trained clinical staff	Identification of motor subtypes Short version of the DMSS with 4 items: 2 hyperactive items, 2 hypoactive items	Cut-off: 1 "positive" item	< 5 min	Concordance for subtype attribution between original DMSS and DMSS-4: κ = 0.63	[37]	Not for delirium screening or monitoring, only suitable for determination of motor subtype
DOM (Delirium-O-Meter)	Older patients (n = 92) I: clinical staff	Monitoring Severity scoring included 12 items	Score 0-36 (higher score = higher delirium severity)	3-5 min	IRR on item level: 0.40-0.97, $p < 0.05$. Sens to change (DOM and DRS-R-98 each assessed at 3 time points, comparison of Δ DOM and Δ DRS-R-98): $\rho = 0.80-0.95$, $p < 0.001$	[27]	Suitable for scoring and monitoring of delirium severity, not for delirium screening
DRS (Delirium Rating Scale)	Rockwood: Geriatric/psychiatric patients (n = 791) Rosen: Geriatric/psychiatric patients (n = 104) + collateral history I: trained clinical staff	Screening + monitoring Severity scoring included 10 items	Score 0-32 Cut-off $\geq 12 / \geq 10 / \geq 7.5$	Estimated time: Scoring: 15 min Gathering information from family, staff, medical records: variably	IRR: ICC 0.91-0.97 Sens 0.82-0.94 Spec 0.82-0.94 (with cut-off ≥ 10) RS: delirium diagnosis by psychiatrist based on DSM-III criteria	[65] [64] [53, 54]	Cut-off inconsistent: Original article: no information; Trzepacz 1999: "about 12 points"; some studies (Rockwood 1996, Rosen 1994) used other cut-offs (10 p., 7.5 p.)

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Abbreviation (full name)	Target patient group / investigator (I)	Screening vs. monitoring Items	Scoring	Average duration	Psychometric properties	Reference	Critical appraisal
DRS-R-98 (Delirium Rating Scale-Revised-98)	Adult patients (n = 68) + collateral history I: trained clinical staff	Screening + monitoring Severity scoring included 16 items (13 severity items, 3 diagnostic items)	Total score 0-46 Cut-off ≥ 17.75 Severity score 0-39 Cut-off ≥ 15.25	Scoring: 20-30 min Gathering information from family, staff, medical records: 1-2 hours	Total score: Sens 0.91-1.00, Spec 0.85-1.00 Severity score: Sens 0.86-1.00, Spec 0.77-0.93 RS: DRS, CTD, Clinical Global Impression (CGI), all rated by psychiatrist IRR: ICC total score 0.98; ICC severity score 0.99	[66]	Time-intensive tool, and for that reason limited clinical applicability Suitable for use in longitudinal studies on delirium, e.g. treatment research
DSB (Digit Span Backwards)	Leung: Older (≥ 75 years) acute admission patients (n = 144) O'Keeffe: Acute geriatric patients (n = 110) I: trained clinical staff	Screening + Monitoring (with other digits)	Cut-off < 3 (Leung) / < 4 (O'Keeffe)	5 min	Leung: Sens 0.81, Spec 0.63 O'Keeffe: Sens 0.83, Spec 0.96 RS: delirium diagnosis by geriatrician based on DSM-III-R criteria	[32] [46]	Effective to identify patients with major cognitive impairment Not suitable as a single tool in delirium diagnosis
DSI (Delirium Symptom Interview)	Older acute care patients ≥ 65 years (n = 50) I: trained clinician or lay rater	Screening + Monitoring 32 items representing 7 domains	Disorientation <u>or</u> disturbance of consciousness <u>or</u> perceptual disturbance classified as "present" = suspected delirium	10-15 min	IRR: $k=0.90$ Sens/Spec 0.90/0.80 RS: delirium diagnosis by psychiatrist/neurologist	[3]	Extensive instrument with large number of items, thus time-intensive and of limited use for everyday clinical practice

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DSS (Delirium Severity Scale)	Acute care patients ≥ 55 years without dementia (n = 37) I: trained clinician or lay rater	Monitoring Modified versions of Forward Digit Span of the Wechsler Memory Scale–Revised (WMS-R) + Similarities (WAIS-R/WISC-R) Modifications: addition of forward spans with two digits and one digit in cases of fails on the three-digits spans, addition of a third trial at each span length; combination of items of the Wechsler Adult Intelligence Scale-Revised (WAIS-R) and the Wechsler Intelligence Scale for Children-Revised (WISC-R)	Forward Digit Span: 0-24 Similarities: 0-35 No information on cut-offs for different severity categories	10 min	IRR: ICC = 0.99 Concurrent validity (Correlation with quantitative geriatric psychiatrist ratings of delirium severity): $r=-0.44$ to -0.52 ($p=0.02/0.05$)	[5] [9]	Taking account of test acceptability to delirious patients Fee-required test components Not applicable to demented subjects
GAR (Global Attention Rating)	Geriatric patients (n = 87) I: physician (trained clinician)	Screening + Monitoring Method: general conversation between physician and patient for a minimum of 2 minutes	Scoring of attentiveness by physician on a visual analog scale (0-10 cm), answering the question: How well did the patient keep his mind on interacting with you during the interview? Score 0-10 Cut-off: < 7 = suspected delirium	2 min (minimum)	IRR: ICC 0.83 All patients (with and without cognitive impairment): Sens: 0.94, Spec: 0.99 Cognitively impaired patients: Sens: 0.94, Spec: 0.94 RS: delirium diagnosis by geriatrician based on DSM-III-R criteria	[46]	Much experience with delirious patients required, no objective criteria available, subjective rating
GCS (Glasgow Coma Scale)	Acute stroke unit patients, median age 74 years (n = 111) I: trained rater (medical student)	Screening	Score: Eye opening (E) 1-4, Verbal response (V) 1-5 Cut-off: E < 4 +/- V < 5 = suspected delirium	< 1 min	Sens 0.17 Spec 0.81 RS: delirium diagnosis based on CAM	[30]	Attempt to use GCS for delirium screening, results (poor sensitivity) similar to ALOC results RASS/mRASS more suitable
I-AGeD (Informant Assessment of Geriatric Delirium)	Geriatric patients with caregiver (n = 88) Observation of caregiver (self-administration of questionnaire by caregiver)	Screening 10 items	Score 0-10 Cut-off: > 4 = suspected delirium	5 min	Sens/Spec compared to CAM: 0.82/0.64 Sens/Spec compared to clinical diagnosis of delirium by geriatricians using DSM-IV criteria: 0.70-0.89/0.63-1.00	[50]	Missing data as limitation

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ICDSC (Intensive Care Delirium Screening Checklist)	ICU patients (n = 93) + collateral history I: clinician/nurse	Screening 8 items	Score 0-8 Cut-off: ≥ 4 = suspected delirium 1-3 = subsyndromal delirium	< 5 min	Sens/Spec (estimated from ROC curve, at cut-off score of 4 points): 0.99/0.64 RS: delirium diagnosis by psychiatrist	[4, 71]	Utility as a screening tool, not as a diagnostic tool (because of low specificity)
Inter-RAI AC (Inter Resident Assessment Instrument Acute Care) Delirium Screener	Acute care patients ≥ 70 years (n = 239) + collateral history I: trained nurse	Screening 2 items (acute change and fluctuation of mental function = 2 of 4 delirium items contained in the Inter-RAI AC Assessment System consisting of a total of 62 items)	1 of 2 items positive = suspected delirium	< 5 min	Sens 0.82 Spec 0.91 RS: clinical delirium diagnosis by experienced geriatrician, based on DSM-IV criteria	[57]	In the context of Inter-RAI AC use tool seems suitable for delirium screening
IPT (Interlocking Pentagons Test)	Geriatric medical patients, mean-age 79.9 years (n = 193) I: trained rater	Screening Figure of two intersecting pentagons has to be copied	Score 1-6 Cut-off: < 4 = suspected delirium	< 2 min	Sens 0.71 Spec 0.73 RS: delirium diagnosis based on DSM-IV criteria and DRS-R-98	[31]	Test is part of MMSE, able to detect cognitive deficits, not delirium-typical characteristics
MDAS (Memorial Delirium Assessment Scale)	Patients with cancer or AIDS (n = 33) + collateral history I: trained psychiatrist/psychologist	Screening + Monitoring Severity scoring included 10 items	Each item scored 0-3 Total score 0-30 Cut-off: ≥ 13 = suspected delirium	≥ 10 min patient assessment + 15-30 min external assessment	IRR: ICC = 0.92 (2 psychiatrists) Sens/Spec 0.71/0.94	[7]	Time-intensive, not suitable for every-day clinical use
NEECHAM (Neelon and Champagne) Confusion Scale	Neelon: Patients ≥ 65 years (n = 158, pilot testing) + collateral history (medical records) I: trained clinician or lay rater	Screening + Monitoring Severity scoring included 9 items in 3 subscales: processing, behavior, physiological control	Each item scored 0-2, 0-4, or 0-5 Total score 0-30 (Processing score 0-14, behavior score 0-10, physiological control score 0-6) 30-27=non-delirious 26-25=at risk 24-20=early to mild confusion 19-0=moderate to severe confusion	8-10 min	Pilot testing (n = 158): Sens 0.95, Spec 0.78	[43] [18]	Authors name acute onset and fluctuating course as core symptoms of delirium, but neither of these two aspects is integrated in the NEECHAM instrument

Table S1: Additional delirium detection tools							
Abbreviation (full name)	Target patient group / investigator (I)	Screening vs. monitoring Items	Scoring	Average duration	Psychometric properties	Reference	Critical appraisal
OBS (Organic Brain Syndrome Scale)	Cardiac surgical patients ≥ 60 years (n = 52) I: trained rater	Screening Disorientation subscale 16 items Confusion subscale 39 items	Score 0-165 (each item 0-3) No cut-off defined	10-15 min	“Complete agreement with CAM” concerning delirium diagnosis Items addressing 4 domains significantly differentiating delirious from non-delirious patients: concentration, disorientation, memory, latency in reaction and response to verbal stimuli	[6] [12]	Insufficient information on psychometric properties Small sample Tool seems to be widely used in Scandinavia, often as the reference standard for delirium diagnosis
OMC (Orientation Memory Concentration Test) → see 6-ICT	see 6-ICT	see 6-ICT	see 6-ICT	see 6-ICT	see 6-ICT	[28]	
OSLA (Observational Scale of Level of Arousal)	Acute and rehabilitation hospital patients ≥ 70 years (n = 114) I: “delirium expert”/physician	Screening + Monitoring 5 items: eye opening, eye contact, posture, movement, communication	Score 0-19 Cut-off: ≥ 4 = suspected delirium	< 1 min	All patients: Sens 0.85, Spec 0.92, AUC: 0.92 Patients with dementia: Sens 0.74, Spec 0.96, AUC: 0.93 RS: delirium diagnosis by physician based on DSM-5 criteria	[51]	Small sample size per site No information on blinding of reference standard and delirium detection tool assessors
OSLA/SAVEAHA ART	Acute and rehabilitation hospital patients ≥ 70 years (n = 109) I: “delirium expert”/physician	Screening Combination of the tools OSLA and SAVEAHAART	Score 0-29 Cut-off: ≥ 10 = suspected delirium	< 2 min	All patients: Sens 0.84, Spec 0.92, AUC 0.94 Patients with dementia: Sens 0.94, Spec 0.92, AUC 0.98 RS: delirium diagnosis by physician based on DSM-5 criteria	[51]	Small sample size per site No information on blinding of reference standard and delirium detection tool assessors
O3DY (Ottawa 3DY)	ED patients ≥ 65 years (n = 301) I: trained rater	Screening Serial administration twice daily (at least 6 hours between measurements), starting after 8 hours ED stay and ongoing up to 24 hours after hospital ward admission 4 items	Any incorrect answer/error = cognitive dysfunction/suspected delirium	< 5 min	Patients with at least one positive O3DY compared to patients with at least one positive CAM: Sens 0.87, Spec 0.44 O3DY result compared to CAM result in same patient assessment: Sens 0.63, Spec 0.66 RS: delirium diagnosis based on CAM	[70]	Only patients without significant cognitive impairment included

Table S1: Additional delirium detection tools							
Abbreviation (full name)	Target patient group / investigator (I)	Screening vs. monitoring Items	Scoring	Average duration	Psychometric properties	Reference	Critical appraisal
RADAR (Recognizing Acute Delirium As part of your Routine)	Patients ≥ 65 years (n = 193) I: trained clinical staff or lay rater	Screening 3 items to score while giving patients their medication: drowsiness, problems with following instructions, slow movements	Each item rated “yes” or “no”. Cut-off: ≥ 1 “yes” = suspected delirium	< 1 min	IRR of instrument items: Agreement 82.4-98.0% (k=0.34-0.79) Convergent validity (RADAR item compared to corresponding CAM item): Agreement 52-85% Concurrent validity (RADAR item compared to DSM-IV-TR criterion): Sens 73%, Spec 67%	[68]	Moderate to low psychometric properties Advantage: potential for routine use
RASS (Richmond Agitation Sedation Scale)	ED patients ≥ 65 years (n = 406) I: trained rater/physician	Screening + Monitoring	RASS > 0 or < 0 (RASS > 1 or < -1)	< 1 min	RASS > 0 or < 0: Sens 0.82-0.84, Spec 0.85-0.88 RASS > 1 or < -1: LR+ 19.6-57.0 RS: delirium diagnosis based on DSM-IV criteria IRR: weighted k=0.63	[20]	mRASS with better specificity but interestingly lower sensitivity Compared to ALOC and GCS (similar approach) higher sensitivity
RCDS (Reversible Cognitive Dysfunction Scale)	Patients ≥ 65 years (n = 80) I: trained clinical staff	Screening Severity scoring included 6 items + MMSE score	Items 1-4 each scored 0-4 Item 5 scored 0-3 Item 6 scored 0-5 Sum of six item scores minus MMSE score plus 30 = total score (score 0-54) Cut-off: ≥ 16 = suspected delirium	5 min	PPV/NPV (compared to operationalized reversible cognitive dysfunction): 92.3/96.7 Convergent validity: Agreement with DSM-III-R k=0.69 Agreement with ICD-10 k=0.69 Agreement with CAMDEX k=0.83 Agreement with DRS k=0.60 Agreement with CAM k=0.45	[63]	Additional MMSE application required
SAVEAHAART	Acute and rehabilitation hospital patients ≥ 70 years (n = 109) I: “delirium expert”/physician	Screening “S-A-V-E-A-H-A-A-R-T” (10 single letters) is read, of which 4 letters are “A”, patient has to indicate each time an “A” is heard	Score 0-10 Cut-off: All patients: ≥ 4 errors (incorrect or omitted indication) = suspected delirium Patients with dementia: ≥ 7 errors (incorrect or omitted indication) = suspected delirium	< 1 min	All patients: Sens 0.90, Spec 0.64, AUC 0.80 Patients with dementia: Sens 0.84, Spec 0.73, AUC: 0.79 RS: delirium diagnosis by physician based on DSM-5 criteria	[51]	Small sample size per site No information on blinding of reference standard and delirium detection tool assessors Defined cut-offs differ substantially from the VAT cut-off
SDC (Saskatoon Delirium Checklist)	Presurgical patients (n = 36) I: trained clinician or lay rater	Screening 10 items (DSM-III criteria)	Each item scored 0-4 Total score 0-40 (40 = unimpaired, 0 = maximal delirium) Cut-off: not available	< 5 min	Not available	[39]	No definition/operationalization of symptoms, cut-off value, psychometric properties available

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Abbreviation (full name)	Target patient group / investigator (I)	Screening vs. monitoring Items	Scoring	Average duration	Psychometric properties	Reference	Critical appraisal
Sour Seven Questionnaire	Medical and orthopedic inpatients ≥ 65 years (n = 39) I: observation of untrained caregiver (family member/nurse), questionnaire administration (caregiver) by medical student	Screening/Diagnosis 7 items	Score 0-18 Cut-off: ≥ 4 possible delirium ≥ 9 being diagnostic for delirium	2-5 min	Sens 0.90, Spec 0.90 (cut-off ≥ 4) Sens 0.63, Spec 1.00, PPV 1.00 (cut-off ≥ 9) RS: delirium diagnosis based on CAM/assessment by geriatric psychiatrist based on DSM-5 criteria	[58]	Pilot study, further evaluation needed High acceptance of the questionnaire by caregivers/nurses
SPMSQ (Short Portable Mental Status Questionnaire)	Medical inpatients ≥ 65 years (n = 262) I: psychologist/research assistant	Screening 10 items	Score 0-10 (number of errors) Cut-off: ≥ 3 = suspected delirium	< 3 min	Sens 0.73 Spec 0.89 RS: delirium diagnosis based on "standard clinical criteria"	[13] [40]	No information on blinding of reference standard and SPMSQ assessors According to authors instrument not very suitable for delirium screening
SQeeC (Simple Question for easy evaluation of Consciousness)	Patients ≥ 75 years (n = 100) I: trained clinician or lay rater	Two questions: 1. "Name a place you would like to visit that you have never been before" (modified version: "Imagine that you are well, name a place you would like to visit that you have never been before") 2. "How would you make the journey?"	Patient can't name a place and/or can't provide a logical mode of transport to get there = suspected delirium	< 1 min	All patients: Sens 0.83, Spec 0.81 Subgroup analysis in dementia patients: Sens 0.83, Spec 0.59 RS: clinical delirium diagnosis by experienced geriatrician, based on DSM-IV criteria	[34]	According to subgroup analysis not suitable for distinguishing delirium from dementia
SSF (Spatial Span Forwards)	General hospital adult inpatients (n = 265) I: trained junior medical staff	Screening Sequences of tapped out squares (in total 8 red squares on a white A5-sized card) have to be repeated, starting with a sequence of 2, maximum sequence being 7	Last correctly repeated sequence ≤ 4 = inattention (suspected delirium) or Last correctly repeated sequence ≤ 3 = inattention (suspected delirium)	< 5 min	Cut-off ≤ 4: Sens 0.92, Spec 0.69 Cut-off ≤ 3: Sens 0.77, Spec 0.86 RS: delirium diagnosis by experienced psychiatrist, based on DRS-R-98 and DSM-IV criteria	[48]	Depending on cut-off, either sensitivity or specificity are rather low Might be useful as a single tool in patients without preexisting dementia
SSQ-Delirium (Single Screening Question-Delirium)	Caregivers of acute geriatric inpatients (n = 70) I: self-administration by caregiver	Screening Question to caregiver: "How has your relative's/friend's memory changed with his/her current illness?"	Score 1-5 (1 = much improved, 5 = much worse) Cut-off: ≥ 4 = suspected delirium	< 1 min	Sens 0.77 Spec 0.56 RS: delirium diagnosis based on CAM conducted by trained senior medical student	[23, 55]	Moderate sensitivity, low specificity Advantage: no specific training required, easy-to-use tool

Table S1: Additional delirium detection tools							
Abbreviation (full name)	Target patient group / investigator (I)	Screening vs. monitoring Items	Scoring	Average duration	Psychometric properties	Reference	Critical appraisal
VAS-AC (Visual Analog Scale for Acute Confusion)	Long term care residents (n = 74) I: trained clinician or lay rater	Screening 2 items (?)	Line of 100 mm length 0 mm point = no acute confusion 1-9 mm = possible acute confusion 10-39 mm = mild acute confusion 40-69 mm = moderate acute confusion 70-100 mm = severe acute confusion	< 5 min	IRR = 0.80 Concurrent validity correlated with DSM-IV criteria: Pearson's $r = -0.81$ ($p < 0.001$) Sens 0.97 Spec 0.81	[8, 42]	Derived from the VAS-C (Visual Analog Scale for Confusion) by adding an "A" for "acute" No access to original article (Nagley 1986), so items/ question wording could not be determined
VAT (Vigilance "A" Test)	Acute care patients ≥ 70 years (n = 200) I: trained rater	Screening List of 29 letters is read, of which 11 letters are "A", patient has to indicate each time an "A" is heard	Cut-off: > 2 errors (incorrect or omitted indication) = suspected delirium	< 5 min	Sens 0.82 Spec 0.60 RS: delirium diagnosis based on CAM	[1] [59]	Different Versions of VAT available, one other version consisting of 60 letters with 18 "A" Error-free performance indicates adequate attention, but failure may reflect different limitations (also others than attention)
WORLD Backwards Test	Geriatric medical patients, mean-age 79.9 years (n = 193) I: trained rater	Screening 5 letters to be spelled backwards, 1 point for each correct letter	Score 0-5 Cut-off: < 5 = suspected delirium	< 2 min	Sens 0.90 Spec 0.41 RS: delirium diagnosis based on DSM-IV criteria and DRS-R-98	[31]	Test is part of MMSE, able to detect cognitive deficits, not delirium-typical characteristics
<p><i>AIDS acquired immune deficiency syndrome, AUC area under the curve, CAM confusion assessment method, CAMDEX Cambridge mental disorders of the elderly examination, DAS delirium assessment scale, DSM Diagnostic and Statistical Manual of Mental Disorders, ED emergency department, HR hazard ratio, I investigator, ICC intraclass correlation coefficient, ICD-10 International Statistical Classification of Diseases and Related Health Problems 10, ICU intensive care unit, IRR interrater reliability, k kappa, LR+ positive likelihood ratio, MDS minimum data set, MMSE mini mental state examination, n number, NPV negative predictive value, p probability, PPV positive predictive value, r correlation coefficient, RAI resident assessment instrument, RASS Richmond agitation sedation scale, ROC receiver operating characteristic, RR risk ratio, RS reference standard, Sens sensitivity, Spec specificity, SPMSQ short portable mental status questionnaire, VAS-C visual analog scale for confusion</i></p>							

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